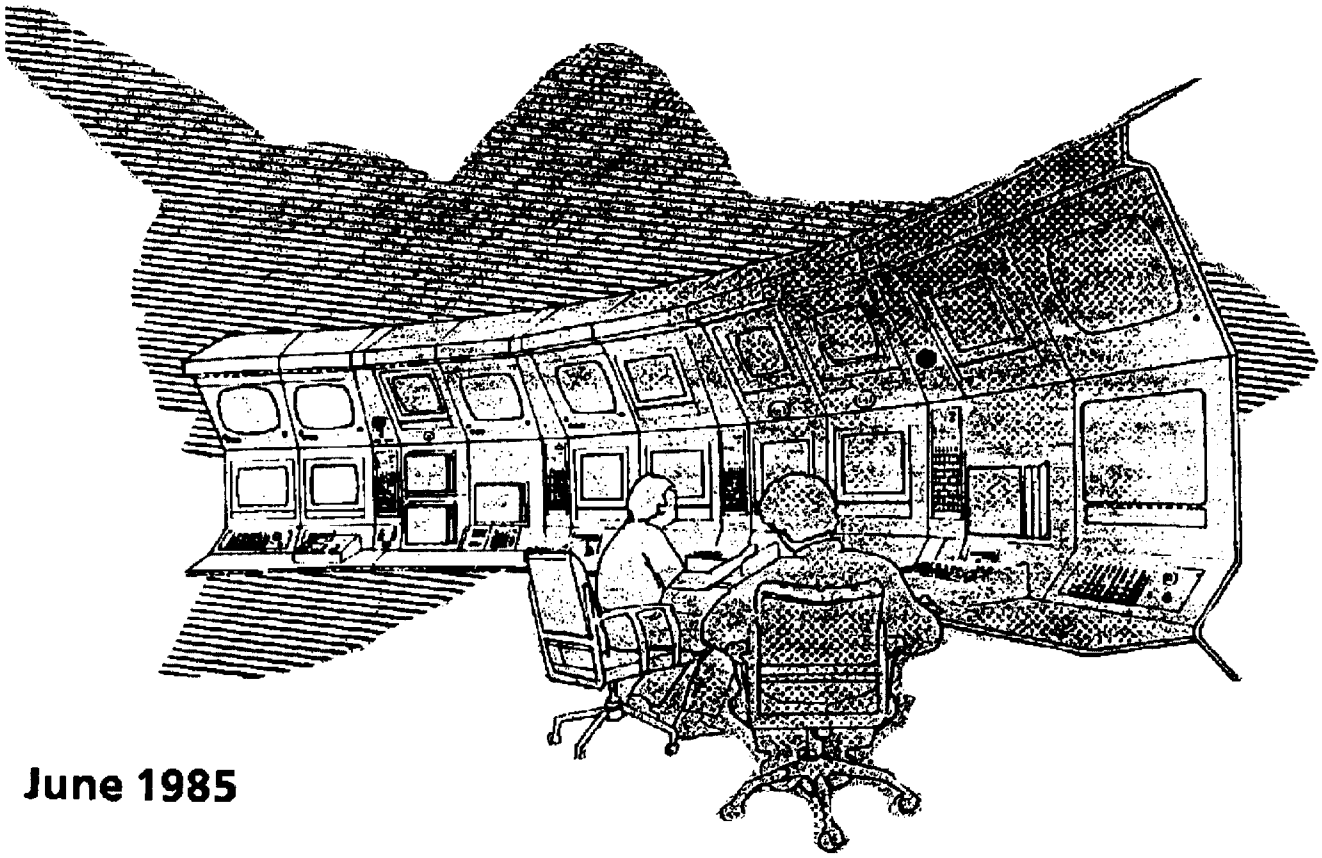
Shuttle Mission Simulator Instructor Station Console Familiarization Manual

Training Division
Flight Training Branch



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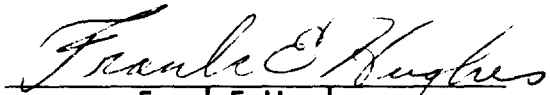

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Preface

This manual is intended to familiarize new training instructors with the console operations at the Shuttle Mission Simulator's instructor stations.

It provides the instructor with a description of the console hardware used to interface with the simulators and explains the data and associated displays used to control the simulation models. Specifically, it addresses the following:

- console hardware configuration
- hardware functions
- simulator data and model control displays
- data recording
- communications capability
- a typical training session

New instructors should read this manual before using the instructor consoles and then use it as a reference while on the console. Readers of this book should have read the *Introduction to Shuttle Mission Simulation* manual to familiarize themselves with the simulation facility and integrated simulations.

The material in this book applies to both the fixed base instructor station (FBIS) and the motion base instructor station (MBIS) unless otherwise noted, since the operation of both stations is identical.

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Contents

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Instructor Stations: An Overview

The Shuttle Mission Simulator (SMS) at the Lyndon B. Johnson Space Center (JSC), building 5, consists of a fixed base crew station, a motion base crew station, a Spacelab simulator, a massive computer facility, simulator operator stations, and instructor stations for both crew stations. The fixed base instructor station (FBIS) and the motion base instructor station (MBIS) are in rooms off the main hallway in the north side of the low bay area in building 5. Figure 1 illustrates the layout of the SMS facility.

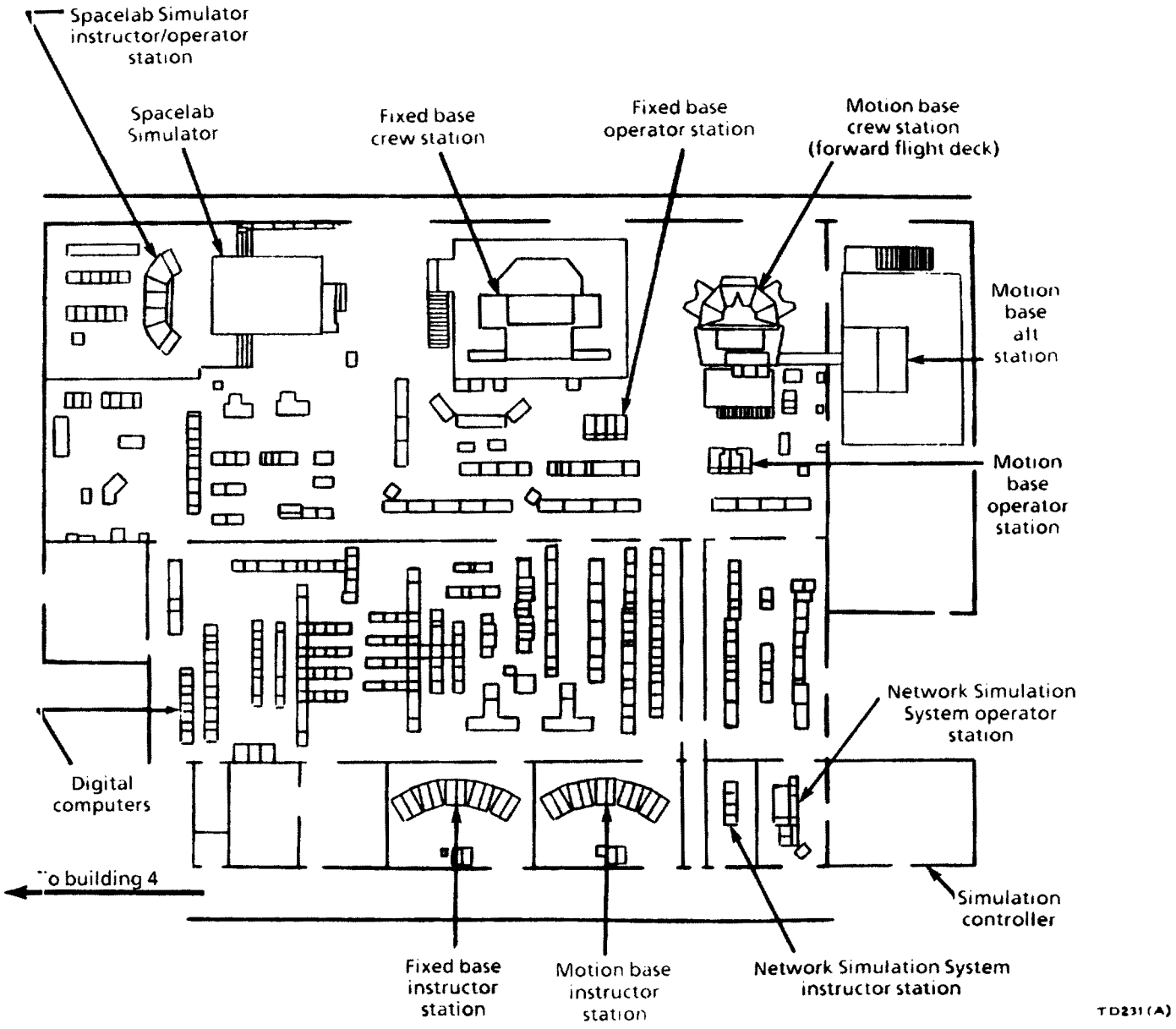

Figure 1. - Layout of the Shuttle Mission Simulator facility.

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Each instructor station (IS) has nine CRT Aydin alphanumeric (A/N) display screens and five graphics display screens, as shown in figure 2. These can be controlled by four keyboard units at the console. The four keyboards are interactive with Aydin screens 4, 5, 7, and 9. In combination, the keyboards and interactive screens are used to control displays on all Aydin and graphics screens. In the FBIS, three TV monitors are provided to display forward window scenes, aft or overhead window scenes, and CCTV system scenes. The MBIS contains only one monitor on which the instructor can select any one of the provided scenes. Each station also has four CRTs that monitor the onboard general purpose computer (GPC) CRTs, one GPC keyboard, six communication control panels, three hardcopy machines, a mission time monitor, three strip chart recorders, and two x-y-y' plotters, all of which are used for data logging. For security reasons, you need a physical control zone (PCZ) card to enter the SMS facility. If you do not already have one (a permanent, a temporary, or an escort-required card), ask your supervisor about the procedures to get one.

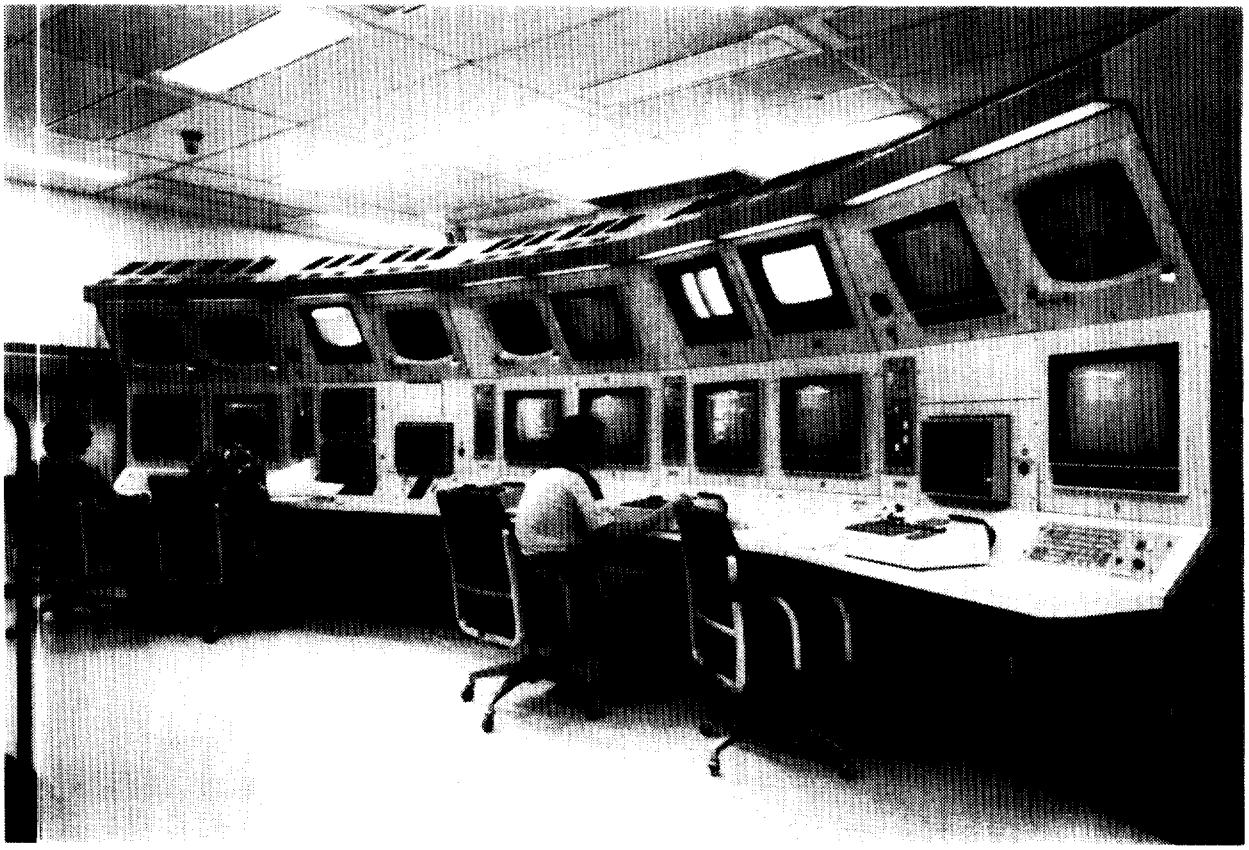


Figure 2. – Photograph of the fixed base instructor station.

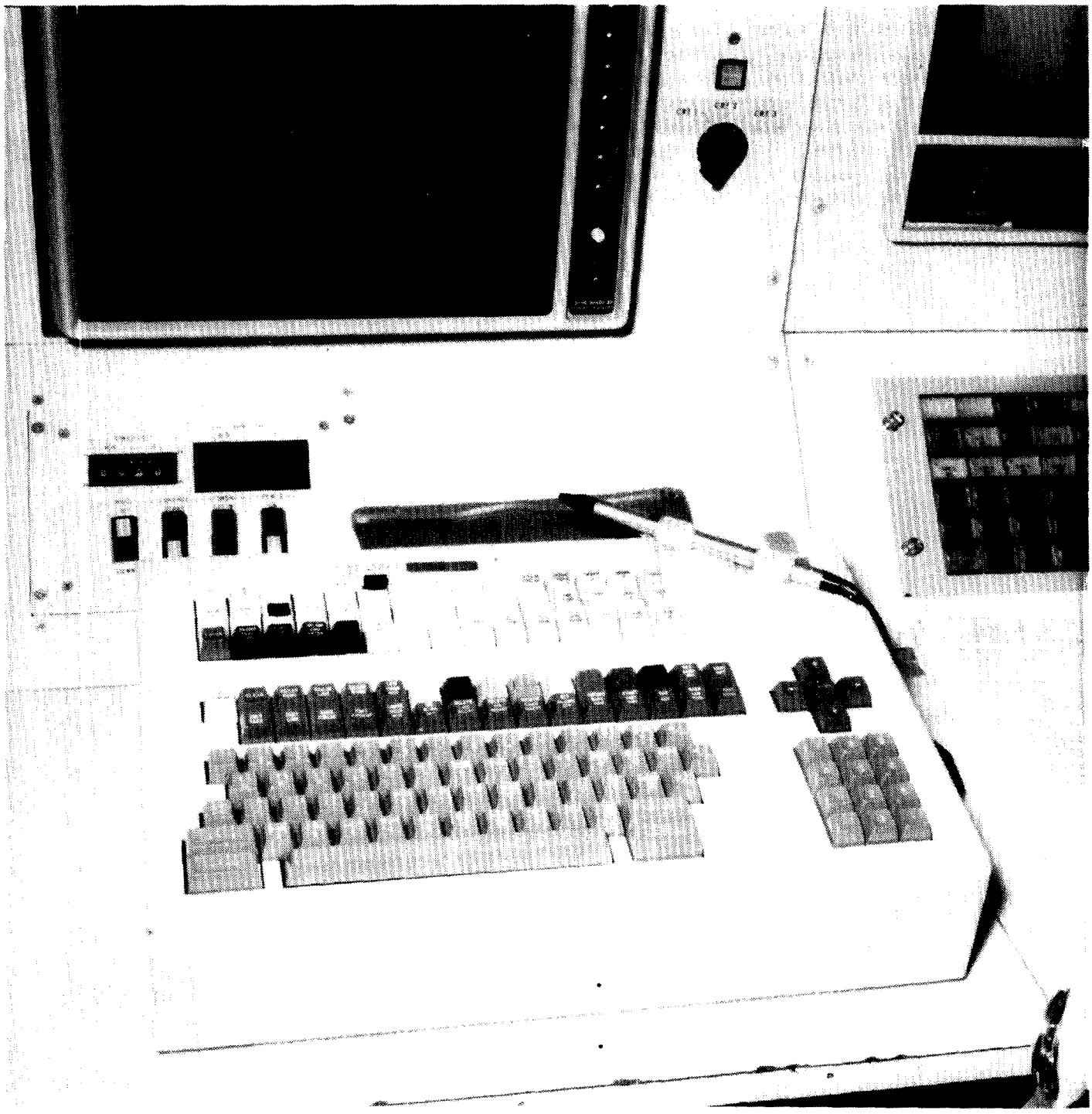


Figure 3. Keyboard showing command keys and programming keys.

Operations at the Consoles

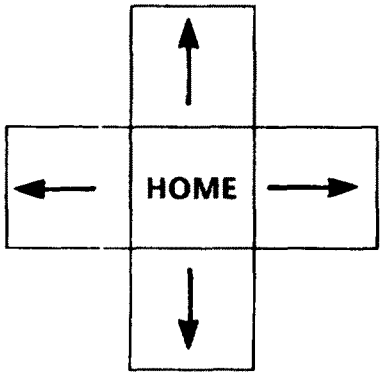
Keyboards and Functions

Figure 3, on the opposite page, is a photograph of a keyboard. Four of these keyboards control all of the Aydin and graphics screens at the IS but are interactive only with the screens directly above them (i.e., Aydin screens 4, 5, 7, and 9).

Command Keys

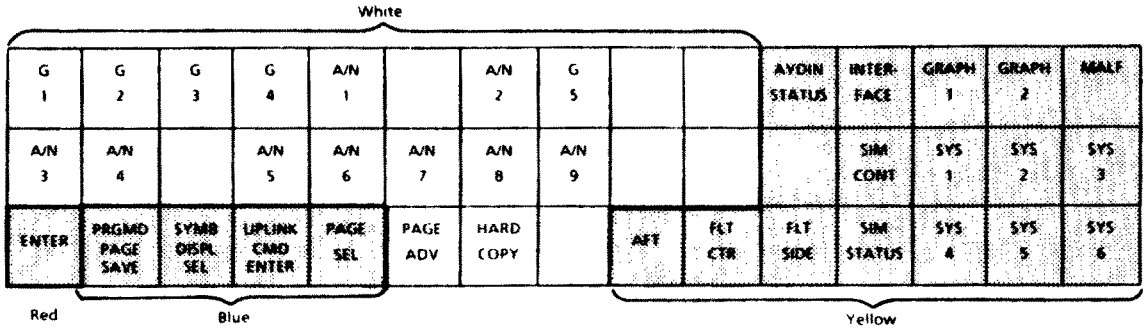
There are five groupings of keys on the keyboard: display control keys, cursor control keys, a numeric keypad, programming keys, and a typewriter keyboard.

The lower section of the keyboard is a standard typewriter keyboard except that all the letters are capitals. The keys are used to type information onto the interactive Aydin screen directly above the keyboard unit (i.e., the interactive Aydin screen) for various purposes (e.g., calling up pages onto the screens, entering values for malfunctions). Exactly what to enter for different purposes and how to do so will be discussed later in the book. In general, the shift key is used for programming and has only limited usage by instructors for daily SMS sessions. The numeric keys beside the typewriter keyboard serve the same function as those on the keyboard; however, they are grouped for convenience, especially for entering a whole series of numbers.



Above the numeric keys are the cursor control keys. The cursor is the little square on the interactive Aydin screen which tells you where you currently are typing (not all parts of the screen allow typing). The HOME position is at the top left corner of the screen, where inputs will be typed in. You can move the cursor by using the pointer keys (shown at left), which move the cursor in the direction indicated by the arrow on the key as long as the key is depressed. Whenever the cursor reaches an edge of the screen, it wraps around to the opposite edge. To move the cursor using the light pen, simply place the pen tip on the screen where you want the cursor and press the pen against the screen until the pen tip retracts and the cursor appears. The space bar on the keyboard may also be used to move the cursor to the right one space at a time.

The white keys in the top section of the keyboard unit (shown below) select the screen that is currently accessible through the keyboard.



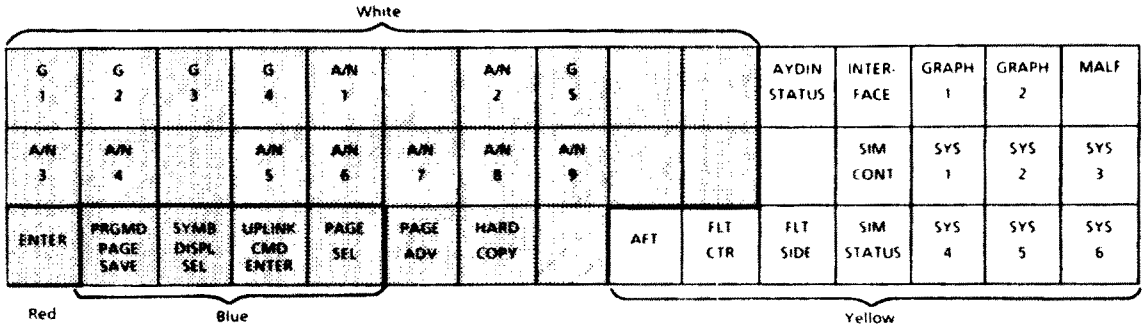
Keys G1 through G5 access the five graphics display screens and A/N 1 through A/N 9 control the nine Aydin screens. The two other screen control keys are the PAGE ADVANCE and HARD COPY keys.

PAGE ADV

In many cases, several pages under one title are joined together in rotation such that depressing the PAGE ADV key causes the next page in line to appear on the screen. Whenever the last page of the set is on the screen, depressing this key will call up the first page of the set.

HARD COPY

In the back of each IS room are three hardcopy machines for the Aydin screens, GPC CRT monitors, and graphics screens. This key informs the machine to hardcopy the page on the currently selected screen. (Hardcopies of the four GPC CRT monitors are made by depressing the button beside the desired CRT.) When multiple copies are being made, the message "HARDCOPY TIME LIMIT" on the interactive screen message line indicates that hardcopy requests should cease until the current log of copies is completed and the message disappears.



Most of the yellow keys on the right side of the top section are used to call up menu pages and tables of contents. All these pages are explained

later in this manual and presented in the appendix. The four keys AYDIN STATUS, INTERFACE, SIM CONT, and SIM STATUS are used only by the operator and are not usually accessible to the instructors.

GRAPH 1	GRAPH 2

The two GRAPH keys provide identical menu listings of the graphics displays available for display on graphics screens G1 through G5. GRAPH 2 will be used for future expansion of the graphics displays if necessary.

MALF

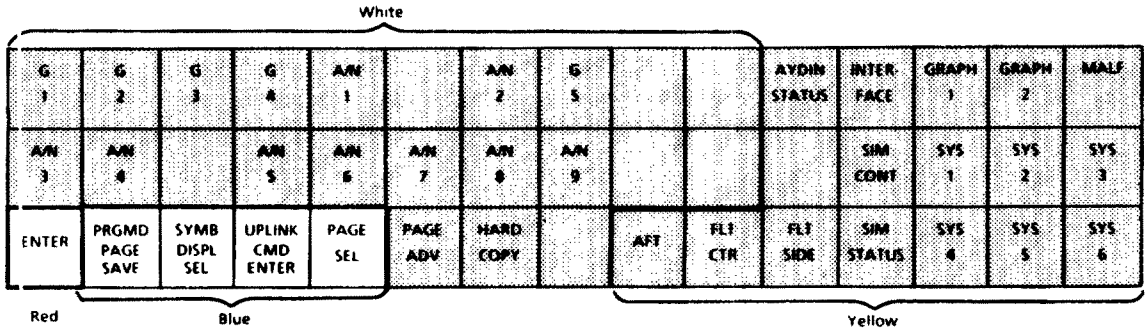
Depressing the MALF key selects the "malfunction menu" page; there will be a detailed discussion of malfunctions later in the book.

SYS 1	SYS '2	SYS 3
SYS 4	SYS 5	SYS 6

These six SYS keys provide six menus of systems displays that can be called up on the Aydin screens. These displays (approximately 200 total) are used for various purposes, such as monitoring the status of various systems and checking crew actions.

AFT	FLT CTR	FLT SIDE

These three crew station keys allow call-up of the crew station switch panel menus. This action allows the instructors to select a panel display on which to monitor the onboard switch positions as the crew executes procedures. Depressing AFT calls up the menu of the flight-deck aft-station panels, while keying FLT CTR selects the menu of the forward, center, and overhead panels and keying FLT SIDE selects the menu of the left and right side panels.



The red and blue keys in the third row of the top section are command keys to the interactive Aydin screens

ENTER

The ENTER key allows you to tell the computer that the data or parameter change you have just typed onto the top of the screen is ready to be entered. Depressing this key enters this information into the IS computer

PRGMD PAGE SAVE

The PRGMD PAGE SAVE key is an operator's key; it is not to be used by the instructors.

SYMB DISPL SEL

The SYMB DISPL SEL key is used to access simulation parameter data. When you want to know the value of a particular "look & enter" (parameters such as propellant quantities, vehicle weight, or center of gravity, whose values can be changed by the SMS operator to initialize a training session), type the name of the parameter on the top line of the interactive screen and depress this key. The parameter's current value will then appear on the second line of the screen.

UPLINK CMD ENTER

The UPLINK CMD ENTER key is an operator's key; it is not to be used by the instructors.

PAGE SEL

The PAGE SEL key is used to display the desired pages on the IS screens. After the mnemonic title of the page to be displayed is typed on the interactive screen line (i,e. the HOME position at the top of the screen), depressing this key causes the desired page to appear on the chosen screen.

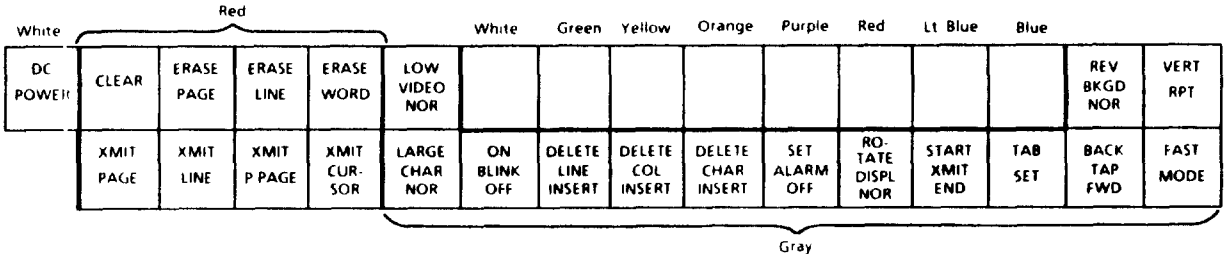
For example, to call up the display called Event Time Monitor on Aydin screen 1, depress the A/N 1 key on any keyboard (the key will light up, indicating that subsequent keyboard inputs will direct displays to that screen). Now home the cursor, type in the page mnemonic A011, and depress PAGE SEL. The Event Time Monitor will appear on Aydin screen 1.

An alternate method of calling up displays is by using the light pen. For example, to call up A011, first display the SYSTEM MENU 1 by depressing SYS 1. The page SYSTEM MENU 1 will appear on the associated CRT. Next, point the light pen anywhere on the mnemonic A011 (note: do not light-pen the actual page name); push the pen against the interactive screen and press the button on the side of the pen. The page EVENT TIME MONITOR will appear on whichever screen you have selected. This method of interacting with the screen by using the light pen will be referred to as simply "light-pen" for the remainder of this book

Generally, when you already know the mnemonic of the desired page, the first method of calling up a page is faster than using the light pen. However, if you do not know the mnemonic of the desired page, you must call up the menu page to find it.

Programming Keys

The section of keys in the middle of the keyboard is used for programming the displays. As an instructor, you will not use these keys except when you want to change the way the pages are displayed, such as reversing the display field (REV BKGD NOR), blinking the characters you type in (ON BLINK OFF), or changing the color of the character you are typing in (with the color keys on the top row).



The XMIT CURSOR key is used when the light pen is not functioning correctly. Simultaneous depression of this key with any of the shift keys serves exactly the same function as depressing the button on the light pen (i.e., it executes whatever procedure you may be performing).

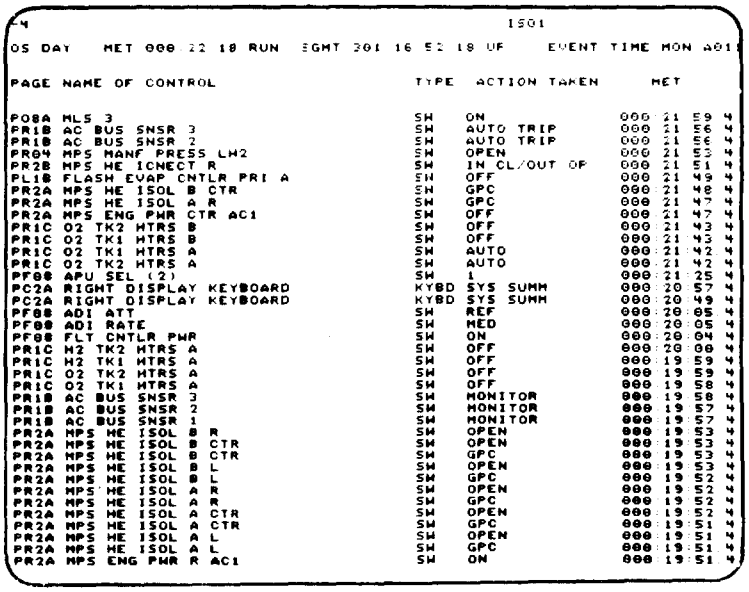
Another key you may find useful is the CLEAR key. Simultaneous depression of this key and a shift key clears data from the top line of the page. This is particularly useful for removing messages which sometimes appear when you make a keyboard entry error.

Special Displays

The following displays have little or no interface capability.

Event Time Monitor (A011)

The Event Time Monitor display lists every switch, circuit breaker, and keyboard entry that the crew executes, in the order it was performed. As an action is performed, the item appears on the top line of the display along with the type of action taken and when it occurred in mission elapsed time (MET). As the page fills up (40 listings), a hardcopy of the page is automatically made, provided that the hardcopy capability has not been turned off (through page A010). As with the graphics pages, the event time monitor is not interactive. Figure 4 is an example of this display.

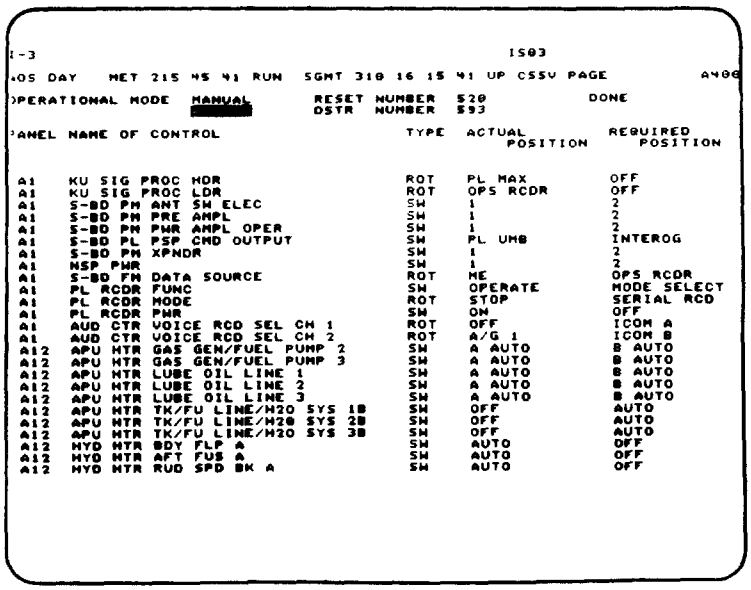


```
                                                    1S01
OS DAY   MET 000 22 10 RUN   SGMT 301 16 52 18 UP      EVENT TIME MON A011

PAGE  NAME OF CONTROL                          TYPE  ACTION TAKEN      MET

P08A  MLS 3                                    SW    ON              000 21 59 4
PR1B  AC BUS SNSR 3                            SW    AUTO TRIP       000 21 56 4
PR1B  AC BUS SNSR 2                            SW    AUTO TRIP       000 21 56 4
PR04  MPS MANF PRESS LH2                       SW    OPEN            000 21 53 4
PR2B  MPS HE IGNECT R                          SW    IN CL/OUT OF    000 21 51 4
PL1B  FLASH EVAP CNTLR PRI A                   SW    OFF             000 21 49 4
PR2A  MPS HE ISOL B CTR                        SW    GPC             000 21 48 4
PR2A  MPS HE ISOL A R                          SW    GPC             000 21 47 4
PR2A  MPS ENG PWR CTR AC1                      SW    OFF             000 21 47 4
PR1C  O2 TK2 HTRS B                            SW    OFF             000 21 43 4
PR1C  O2 TK1 HTRS B                            SW    OFF             000 21 43 4
PR1C  O2 TK1 HTRS A                            SW    AUTO            000 21 42 4
PR1C  O2 TK2 HTRS A                            SW    AUTO            000 21 42 4
PF08  APU SEL (2)                              SW    1               000 21 25 4
PC2A  RIGHT DISPLAY KEYBOARD                   KYBD  SYS SUMM        000 20 57 4
PC2A  RIGHT DISPLAY KEYBOARD                   KYBD  SYS SUMM        000 20 49 4
PF08  ADI ATT                                  SW    REF             000 20 05 4
PF08  ADI RATE                                 SW    MED             000 20 05 4
PF08  FLT CNTLR PWR                            SW    ON              000 20 04 4
PR1C  H2 TK2 HTRS A                            SW    OFF             000 20 00 4
PR1C  H2 TK1 HTRS A                            SW    OFF             000 19 59 4
PR1C  O2 TK2 HTRS A                            SW    OFF             000 19 59 4
PR1C  O2 TK1 HTRS A                            SW    OFF             000 19 58 4
PR1B  AC BUS SNSR 3                            SW    MONITOR         000 19 58 4
PR1B  AC BUS SNSR 2                            SW    MONITOR         000 19 57 4
PR1B  AC BUS SNSR 1                            SW    MONITOR         000 19 57 4
PR2A  MPS HE ISOL B R                          SW    OPEN            000 19 53 4
PR2A  MPS HE ISOL B CTR                        SW    OPEN            000 19 53 4
PR2A  MPS HE ISOL B CTR                        SW    GPC             000 19 53 4
PR2A  MPS HE ISOL B L                          SW    OPEN            000 19 53 4
PR2A  MPS HE ISOL B L                          SW    GPC             000 19 52 4
PR2A  MPS HE ISOL A R                          SW    OPEN            000 19 52 4
PR2A  MPS HE ISOL A R                          SW    GPC             000 19 52 4
PR2A  MPS HE ISOL A CTR                        SW    OPEN            000 19 52 4
PR2A  MPS HE ISOL A CTR                        SW    GPC             000 19 51 4
PR2A  MPS HE ISOL A L                          SW    OPEN            000 19 51 4
PR2A  MPS HE ISOL A L                          SW    GPC             000 19 51 4
PR2A  MPS ENG PWR R AC1                        SW    ON              000 19 51 4
```

Figure 4.– Event Time Monitor display.

Crew Station Switch Verification Page (A400)

This page lists all the switches and circuit breakers that are out of configuration for the current reset point or data store. It can be used before a run or during holds to verify switch positions. The out-of-configuration switches are listed by panel number, name, type of switch, actual position, and required position. The operational mode at the top of the page shown in figure 5 can be light-penned to either MANUAL or AUTO. This page is available only to the operator. If the instructor wants it, he or she must ask the operator to supply it via the engineering mode.



```
                                                    1S03
OS DAY   MET 215 05 41 RUN   SGMT 310 16 15 41 UP CSSV PAGE          A400

OPERATIONAL MODE  MANUAL        RESET NUMBER  $20          DONE
                                DSTR  NUMBER  $93

PANEL  NAME OF CONTROL                         TYPE  ACTUAL POSITION   REQUIRED POSITION

A1     KU SIG PROC NOR                         ROT   PL MAX            OFF
A1     KU SIG PROC LDR                         ROT   OPS RCDR          OFF
A1     S-BD PM ANT SW ELEC                     SW    1                 2
A1     S-BD PM PRE AMPL                        SW    1                 2
A1     S-BD PM PWR AMPL OPER                   SW    1                 2
A1     S-BD PL PSP CMD OUTPUT                  SW    PL UMB            INTEROG
A1     S-BD PM XPNDR                           SW    1                 2
A1     NSP PWR                                 SW    1                 2
A1     S-BD PM DATA SOURCE                     ROT   ME                OPS RCDR
A1     PL RCDR FUNC                            SW    OPERATE           MODE SELECT
A1     PL RCDR MODE                            ROT   STOP              SERIAL RCD
A1     PL RCDR PWR                             SW    ON                OFF
A1     AUD CTR VOICE RCD SEL CH 1              ROT   OFF               ICOM A
A1     AUD CTR VOICE RCD SEL CH 2              ROT   A/G 1             ICOM B
A12    APU HTR GAS GEN/FUEL PUMP 2             SW    A AUTO            B AUTO
A12    APU HTR GAS GEN/FUEL PUMP 3             SW    A AUTO            B AUTO
A12    APU HTR LUBE OIL LINE 1                 SW    A AUTO            B AUTO
A12    APU HTR LUBE OIL LINE 2                 SW    A AUTO            B AUTO
A12    APU HTR LUBE OIL LINE 3                 SW    A AUTO            B AUTO
A12    APU HTR TK/FU LINE/H2O SYS 1B           SW    OFF               AUTO
A12    APU HTR TK/FU LINE/H2O SYS 2B           SW    OFF               AUTO
A12    APU HTR TK/FU LINE/H2O SYS 3B           SW    OFF               AUTO
A12    HYD HTR BDY FLP A                       SW    AUTO              OFF
A12    HYD HTR AFT FUS A                       SW    AUTO              OFF
A12    HYD HTR RUD SPD BK A                    SW    AUTO              OFF
```

Figure 5.– The Crew Station Switch Verification page.

In AUTO, when the page fills up it is hardcopied and the display automatically advances to the next page. When all pages have been copied, the instructors can use the pages to reconfigure the crew station. Be advised that this procedure can take up to 1.5 hours to complete depending on the number of switches out of configuration. In MANUAL, one page of data is available for display. As the crew station configuration is made consistent with those items on the page, the item is cleared from the display and a new item is presented. This activity continues until a totally blank page is obtained.

As a general note, at the top of every available display the following information is displayed: simulated communication status (acquisition-of-signal or loss-of-signal) MET, SMS status, Greenwich mean time, page title mnemonic, and page name.

Displays

Four separate types of CRT screens are used on the instructor station console to display SMS data and allow control of simulation system models. These screens consist of f ight type CRTs, TV monitors, Aydin alphanumeric (A/N) screens, and graphics screens such as those shown in figure 6. The type of displays available on each screen and their usage are described on the following pages.

Flight Type CRTs

The four flight type CRTs (see figure 6) provide the instructor repeaters of the crew station CRTs allowing the onboard displays to be monitored. Three are grouped together near the left end of the station and the fourth is near the right end. In the group of three, the upper left CRT shows the display called up on CRT 1 in the crew station and the lower CRT presents the CRT 3 display. The right hand CRT in the group is selectable between the CRT 2 or CRT 4 display (only in FBIS) using the rotary select to the right of the CRT. The far right CRT is selectable to CRT 1, 2, 3, and 4 using the rotary select to the right of this CRT.

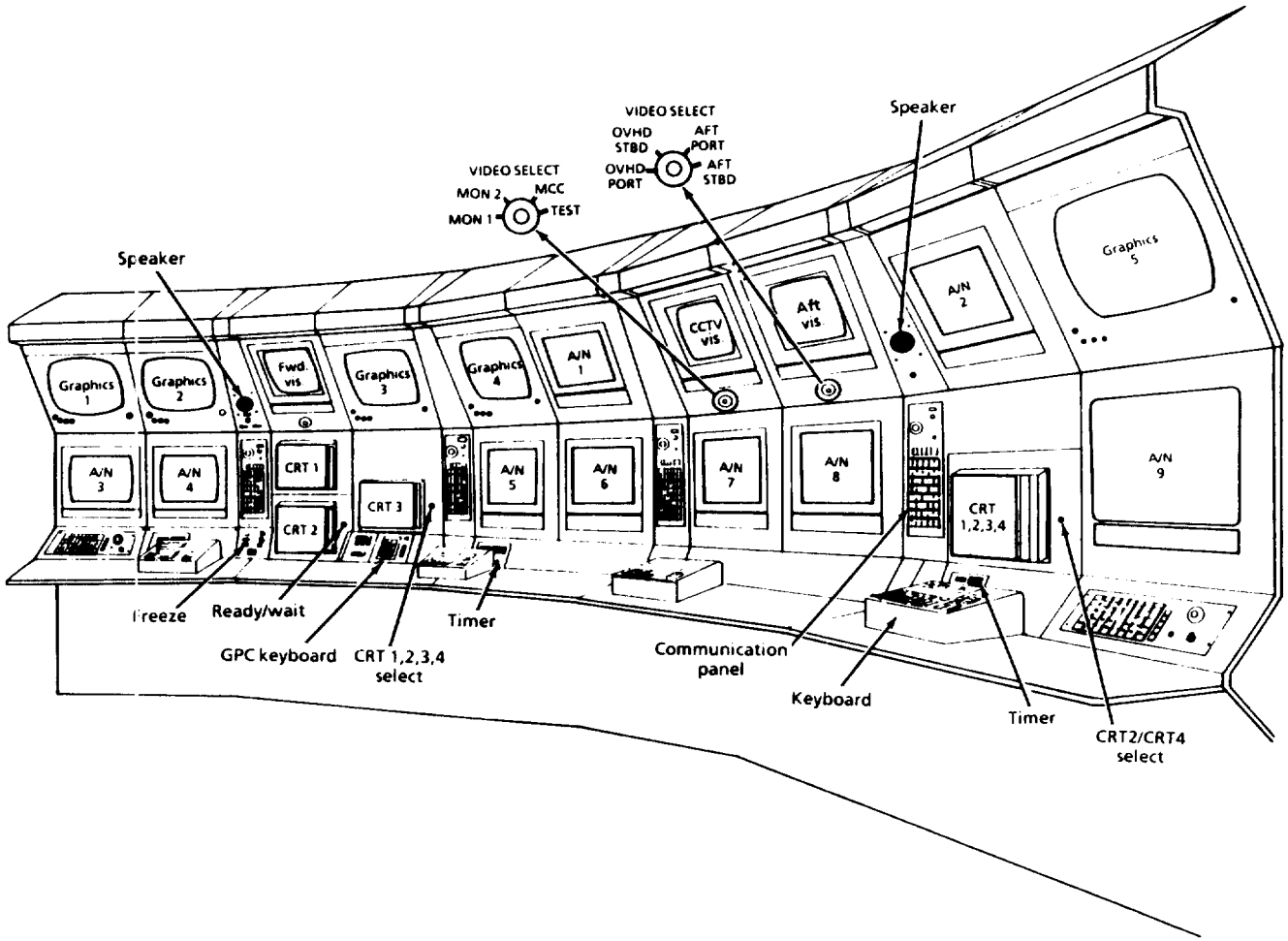


Figure 6. – The instructor station.

TV Monitors

Three TV monitors allow the instructor to view the visual scenes available to the crew. The three monitors are located on the upper portion of the instructor console. The left-most monitor shows the instructor the scene the crew sees in the forward windows if the forward visuals are active. The middle screen is selectable so the instructor can display the visual scene the crew has selected on the crew station monitor 1, monitor 2, or for downlink to the MCC. The test position is for maintenance purposes only. The right-most monitor is selectable to the various aft crew station window visual scenes if the aft visuals are active.

Graphics Displays

The displays on the graphics screens provide a pictorial representation of information only and are not interactive. When requesting one of these displays, you must have a graphics (G1, 2, 3, 4, 5) screen currently selected on the keyboard. Otherwise, an error message will flash on the right-hand side of the interactive line. Figure 7 is an example of a graphics display.

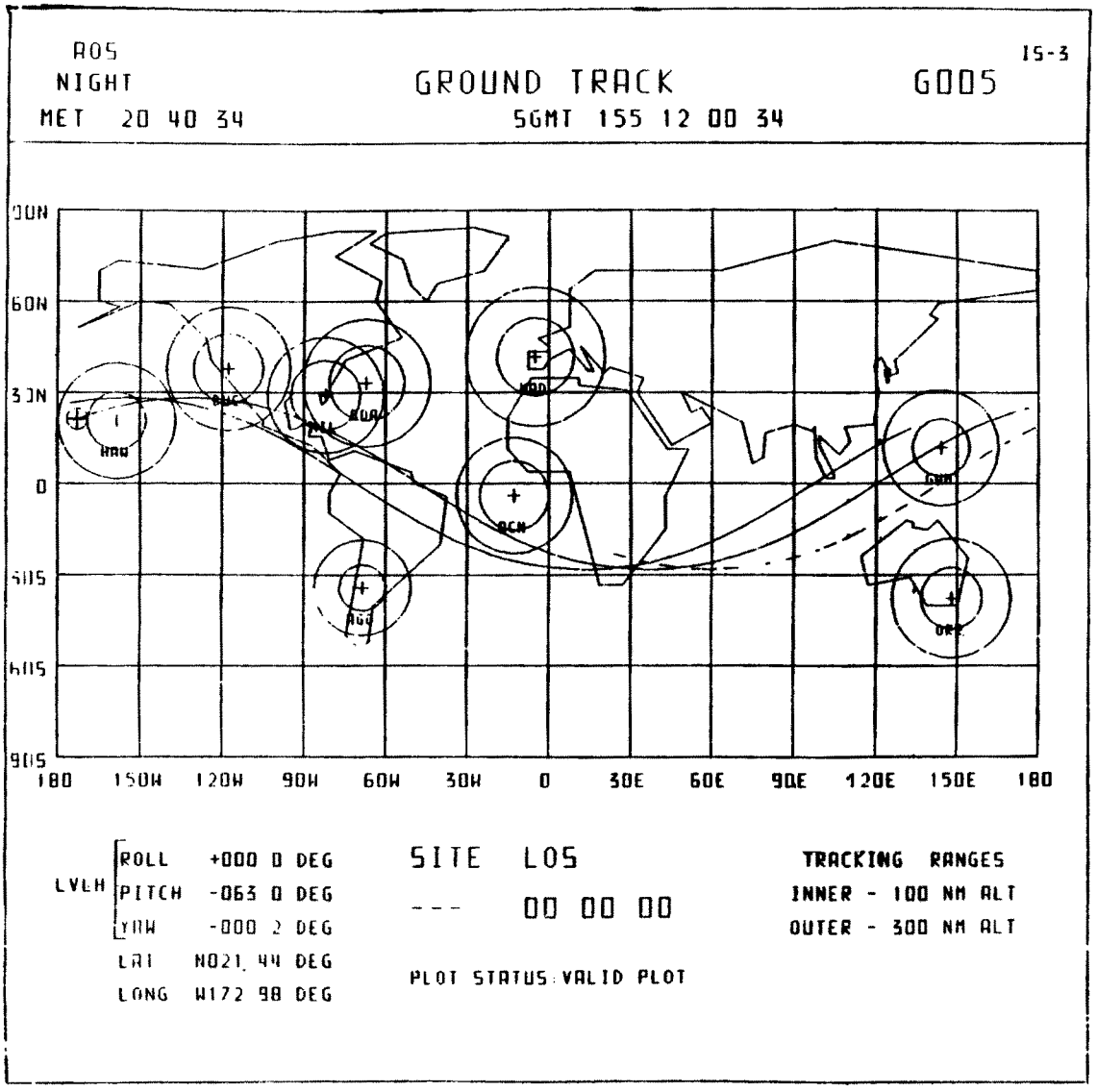


Figure 7.– Graphics display showing Orbiter groundtrack.

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Aydin A/N Displays

The major portion of displays available to an instructor will be displayed on the nine Aydin screens. These displays include menu pages, crew station panel repeater pages, systems status and control pages, and special operations and configuration pages. There are also operator pages that are normally not available to the instructor and therefore will not be discussed in this text. Each page displayed on the Aydin screen provides a standard header as shown in figure 8. The data provided includes the simulated communication status of acquisition-of-signal (AOS) or loss-of-signal (LOS), mission elapsed time (MET), simulator status RUN, freeze (FRZ), step ahead (STEP), or reset (REST),* simulated Greenwich mean time (SGMT), instructor operating station (IOS) controller status up when running or blank when not and the page name and mnemonic.

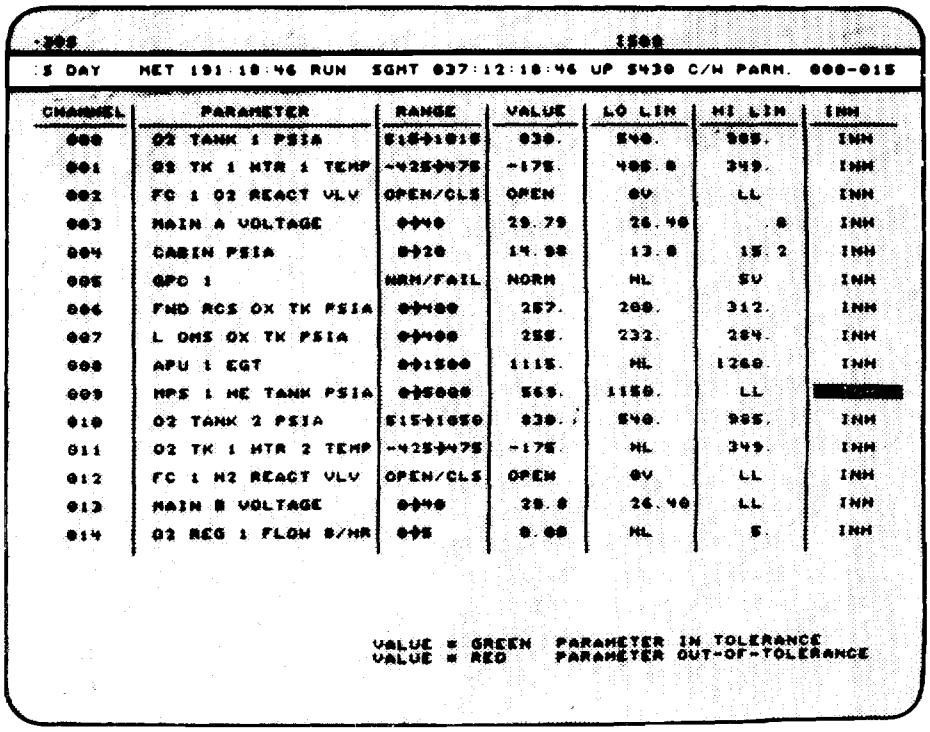

Figure 8.– Standard header.

Aydin Display Formats

Menu Pages

The menu pages provide a listing of the various pages available for display. Figures 9, 10, and 11 provide examples of menu pages for the graphics, systems pages, and panel repeater pages. When the menus are displayed on an interactive Aydin screen, the instructor can light-pen the page mnemonic. This action will display the selected page on the screen specified by the white screen select key on the keyboard. It should be noted that only graphics displays can be assigned to graphics screens and A/N displays to Aydin screens.

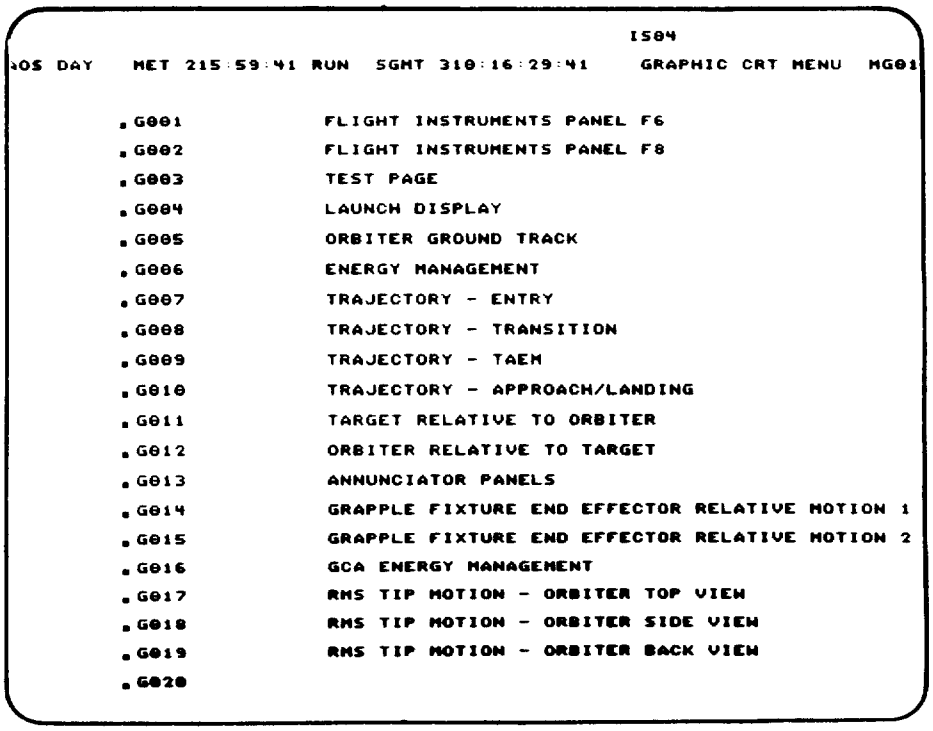

Figure 9.– Example of a Graphic CRT menu page.

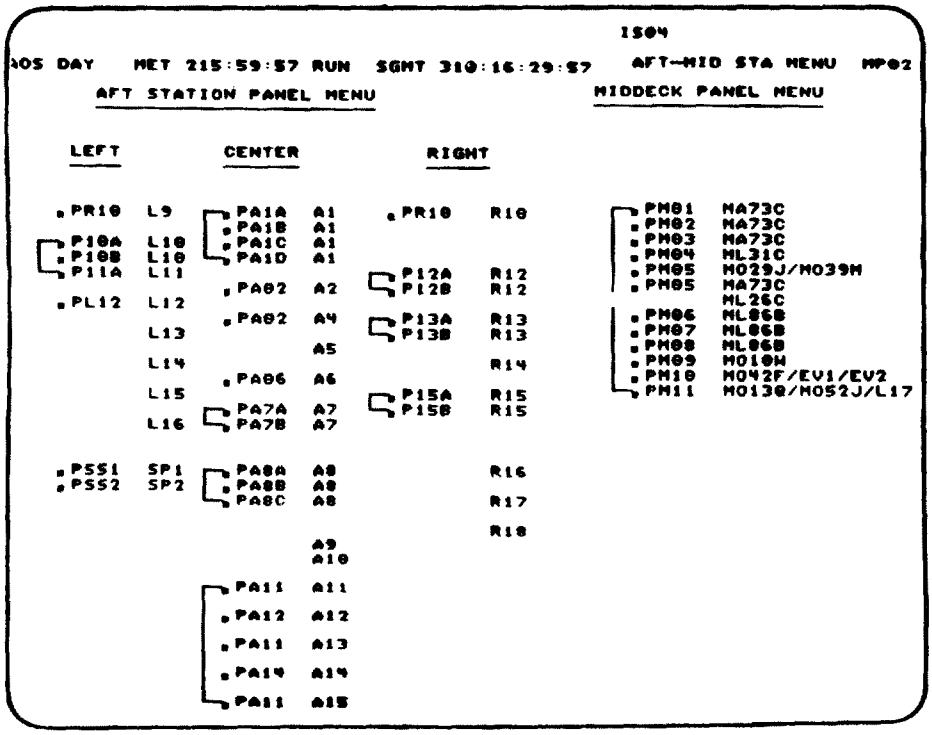

Figure 10.– Example of a panel repeater page.

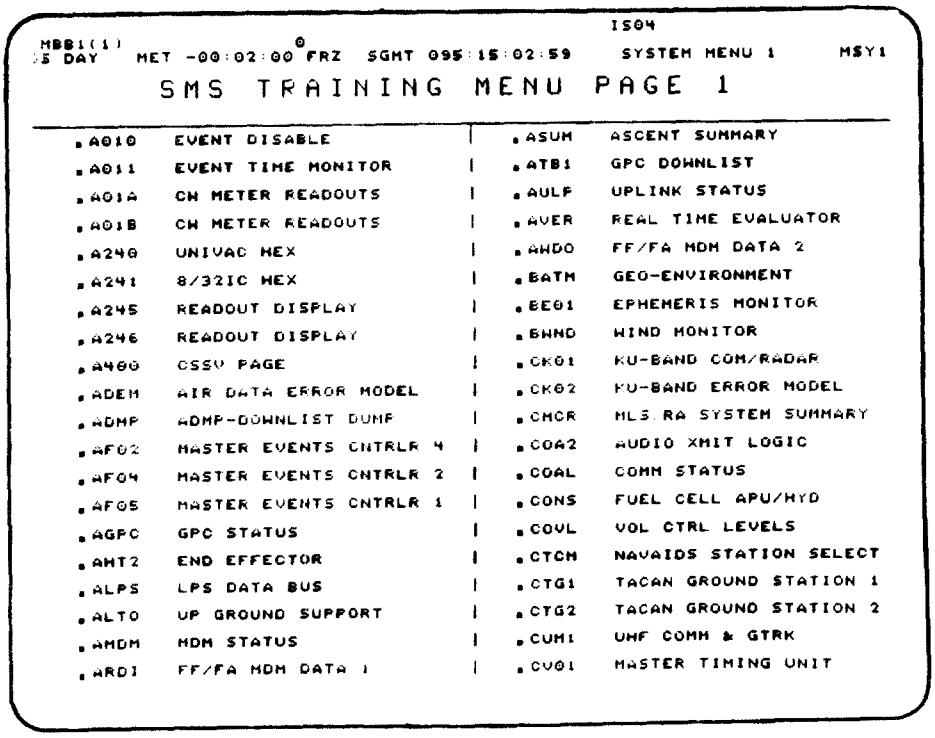

Figure 11.– Example of Systems Menu page.

Panel Repeater Pages

Panel repeater pages provide the instructor with information on the simulator crew station displays and control (D&C) configuration and provide the capability to change individual circuit breaker (cb) and switch (sw) configurations via light-pen entry. The capability allows the simulator to be controlled from the IS without a crew in the crew station, the instructor to correct the D&C configuration, or the instructor to simulate malfunctions. The repeater pages are accessed either via the panel page menus or via direct call-up using the panel page mnemonic. The capability to change the configuration is called parallel switch override (PSO) and PSO is often used as a verb, as in "PSO the switch."

When the simulator is initialized prior to run, the simulation software reads the D&C configuration and initializes to that state. To change the configuration from the IS displays, the instructor calls up the appropriate repeater page on an interactive Aydin screen and PSO's the switch or circuit breaker via light-pen entry.

Following the input, the simulation software ignores the crew station D&C state and processes software according to the IS configuration. Subsequent IS changes to the D&C are possible for the same switch or circuit breaker, and the crew station state is ignored until the crew station D&C state matches the IS state. Then when the crew station state matches the IS state, the software tracks the crew station state until another PSO of the device is made.

Figures 12 and 13 show examples of repeater pages. In figure 12, rows A and B provide examples of two position switches, and rows C and D provide examples of circuit breakers. Figure 13 presents examples of lights, talkbacks (tb), a meter representation, and a rotary switch. The method of enacting a PSO change is to press the light pen on the area required to make the change and depress the light pen button. The completion of the action can be monitored by noting the change in the backlit portion of the device. The following describes the methods of indicating a device's status and any changes in status.

Circuit Breakers

The area which appears as a set of parentheses represents the circuit breaker push/pull mechanism. It is the area where the light pen must be directed to enact a PSO change. This area will be back lit when the software considers the circuit breaker open, a "soft pop" condition (not supplying power) and not backlit when the software considers it closed.

The square area next to the circuit breaker provides a "hard pop" capability. It allows the instructor to physically open a circuit breaker on a panel within the crew station. It should be noted that the circuit breaker may only be physically opened, not closed. When first activated by light pen entry, the block is backlit. When the block is backlit, the circuit breaker cannot be reset in the crew station. A subsequent activation of the box will remove the back lighting and allow the crew to physically reset the circuit breaker.

Switches

The software of the switch is indicated by backlighting the corresponding position nomenclature. The method of changing configuration is to light-pen the nomenclature for the desired position.

Talkbacks, lights and meters

There is no capability to change the configuration of talkbacks, lights, and meters, but their status is displayed.

Caution

Light pen inputs to pushbutton switches can cause a termination of a simulation run.

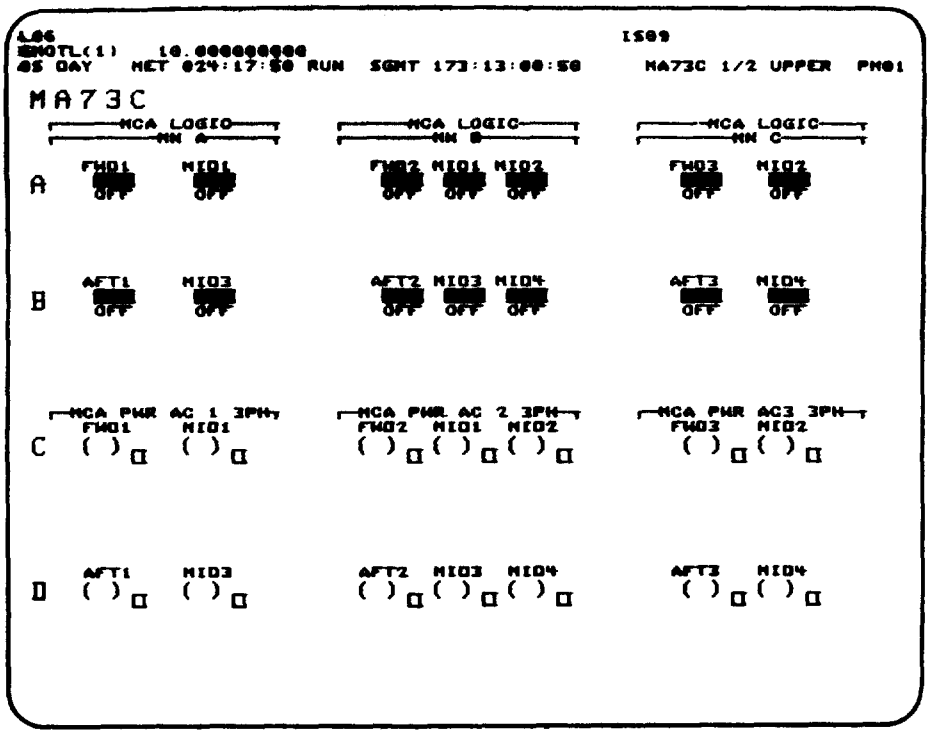

Figure 12.– Panel repeater page.

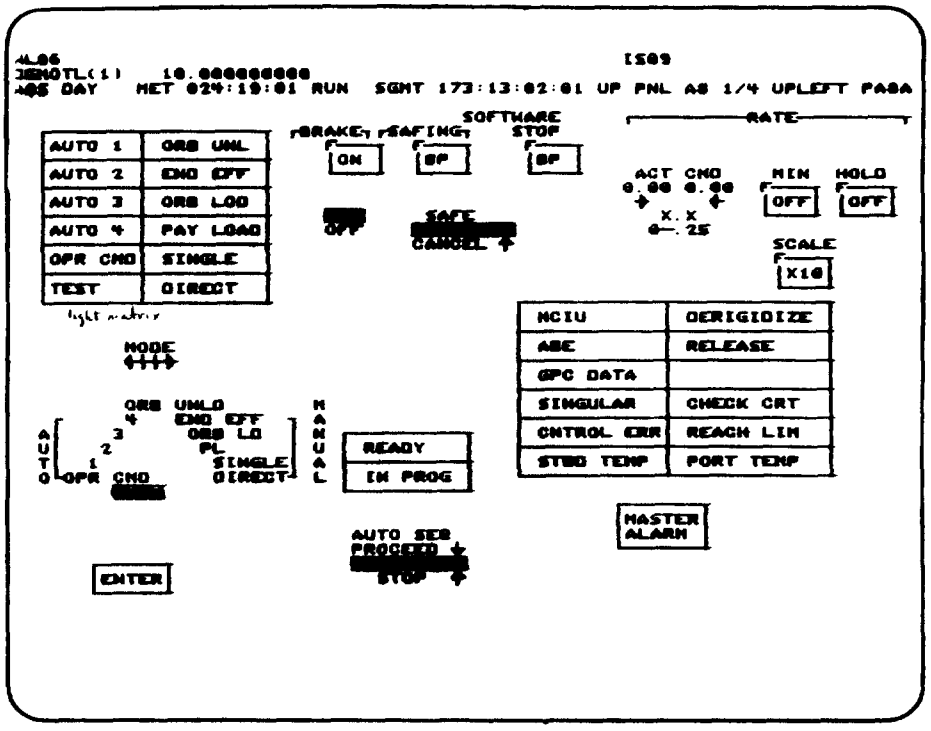

Figure 13.– Panel repeater page showing lights, talkbacks, a meter representation, and a rotary switch.

Let us now go through the procedure for calling up a panel page (panel O7, for example) and changing a switch position. To change a switch position, the selected screen must be interactive (i.e., A/N 4, 5, 7, or 9). First, call up the menu by depressing FLT CTR. Now light-pen the mnemonic O7A, and the page showing the switch positions of panel O7 will appear (see figure 14). The current switch position is indicated by reverse-field display. Suppose that the aft right RCS oxidizer helium isolation valve is in the closed position and you want to move it to the GPC position. Simply light-pen the word "GPC" and the reverse field will jump from "open" to GPC, indicating that the switch is now in the GPC position.

It is important to note that the position of the actual switch in the crew station has not changed, but now the SMS computers read the switch in its new position as if the switch had been moved; thus, in this example, the simulated system functions as if the helium isolation valve is now in GPC instead of closed.

System Model Pages

Systems displays provide an instructor with information on the operational state of the simulation models and provide the capability to modify that state. The displays are generally system specific and are designed to allow instructors to ensure proper operations within their own areas of expertise. The display formats include schematic or flow diagram representations of a subsystem (as in figure 15), alphanumeric parameter data outputs (see figure 16), or a combination of both (see figure 17). The displays can contain noninteractive data which allow the instructor to monitor the system status, interactive data which allow the instructor to bias variable parameters or change discrete data to modify the systems operation, combination of these data, and also areas which allow direct insertion of malfunctions.

Because of the numerous displays and parameters, as well as the multitude of control capabilities, the specifics of these displays are left to the various areas of expertise to provide detail information on the use of each.

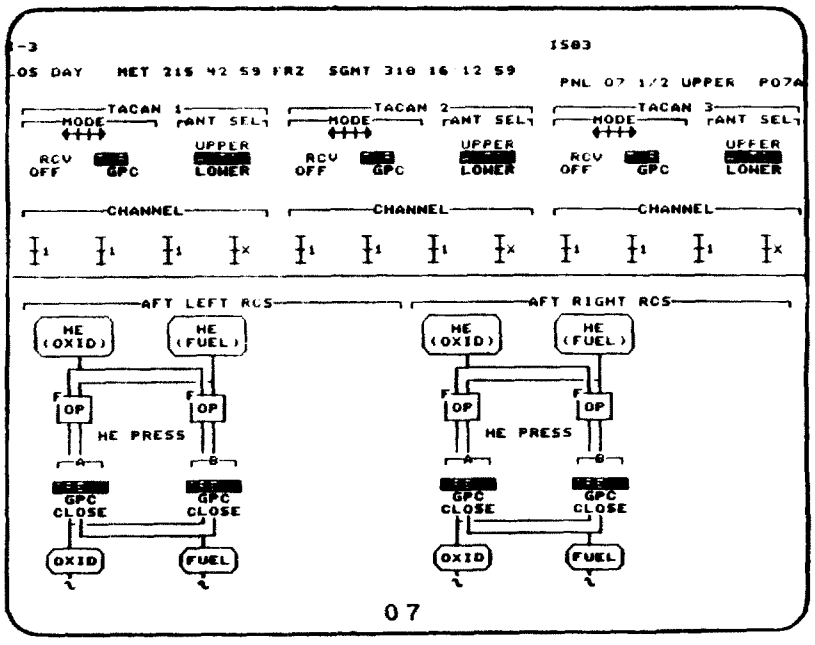

Figure 14.– Panel repeater page showing the switch positions of panel O7.

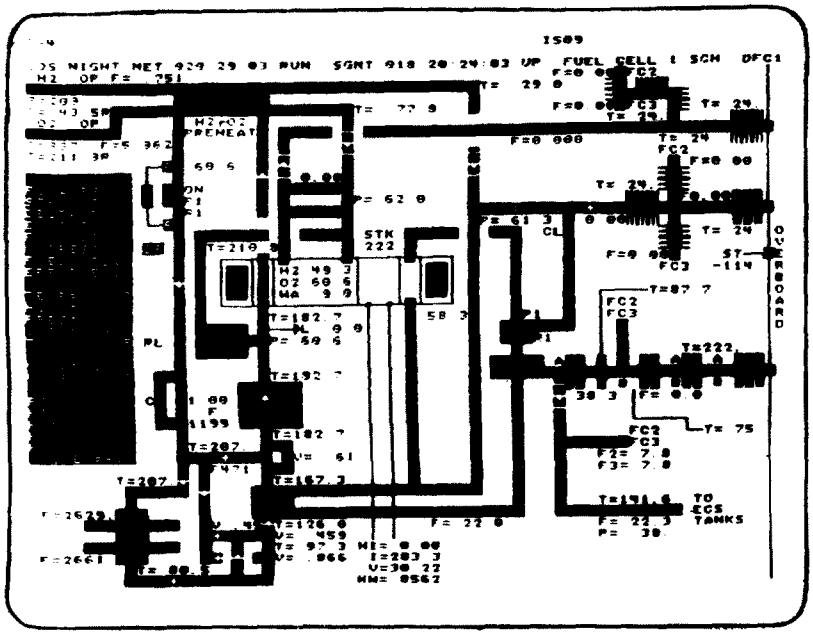

Figure 15.– System model page showing representation of a subsystem.

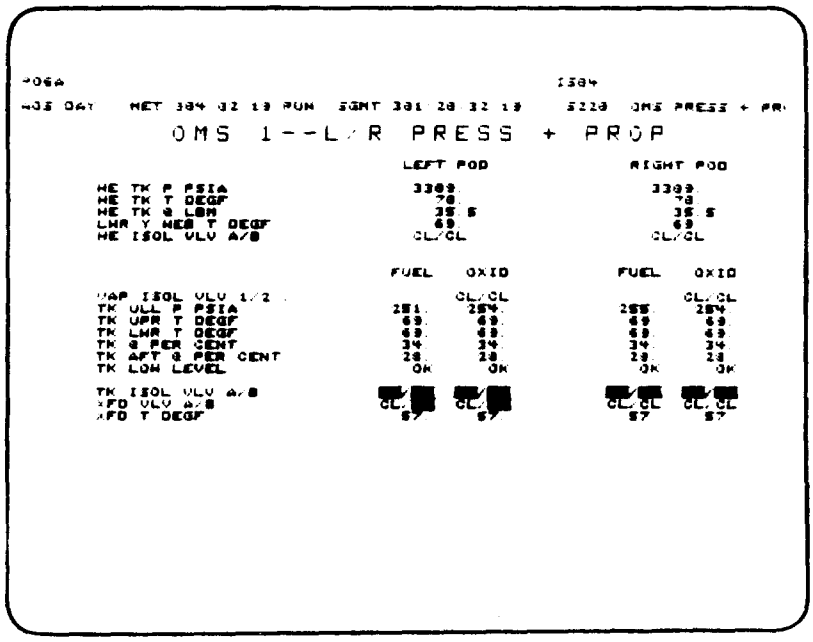

Figure 16.– Alphanumeric parameter outputs.

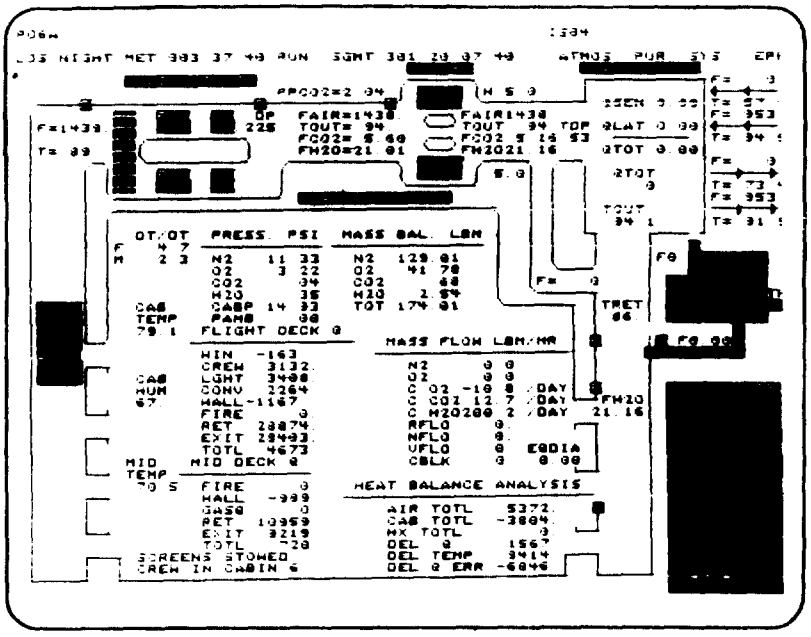

Figure 17.– Combination systems.

Malfunction Pages

The SMS presently has approximately 6800 malfunctions that can be activated from the instructor stations. These malfunctions cover all the simulated Orbiter subsystems and range from simple discrete malfunctions (such as a switch failure) to those which propagate to other systems (such as loss of main engine thrust vector control due to loss of a main bus).

The following sections discuss the procedures for setting up, activating, and deactivating malfunctions.

Malfunction Menu Selection

The initial step in accessing malfunctions is to display the Malfunction Menu header. To do this, the instructor selects an interactive Aydin screen and depresses MALF on the keyboard. This calls up the page (see figure 18) that lists the categories of malfunctions navigation and data processing systems (NAVDP), control systems (CNTRL), propulsion systems (PROPL), Orbiter systems (SYSTM), and communication systems (AUDIO), as well as the associated malfunction control pages A000, A001, A002, A003, and A004 for the NAVDP through AUDIO malfunctions. The header also contains three blocks identified as FS, FF and FB. As various groups of displays are accessed, the FS block indicates the page first selected in the group. FF and FB allow a "file forward" or "file back" cycle through the group. This is accomplished by positioning the cursor within the desired box (FF or FB) and depressing the light pen button. Each light-pen entry then cycles to the next page in the file (group) either forward or backward.

Next the instructor decides which category the desired malfunction falls under (e.g., NAVDP) and light-pens the category name itself. This calls up the malfunction category menu. (See figure 19). For example, to set up a leak in the forward reaction control system (RCS) oxidizer helium tank (FWD HE OX TK LEAK), the instructor would light-pen "PROPL," because the malfunction is part of the propulsion system. This then calls up the page "MENU FOR CATEGORY 3 – PROPULSION," which further subdivides the malfunctions by subsystems (sets).

Next, the instructor should light-pen the mnemonic corresponding to the desired set. This calls up the first page of the set that contains the individual malfunctions. For cases in which more than one page is required to list all the malfunctions in a set, a page counter in the upper right specifies the page presently displayed. In this case, FF or PAGE ADV can be used to access the remainder of the malfunctions in the set.

In our example, you would light-pen RC03, which corresponds to the page "RCS3 MALF." The particular malfunction (FWD HE OX TK LEAK) is listed on this page (see figure 20). The page can also be accessed through the "PAGE SEL" function. In this case, the mnemonic must be preceded by typing a "SHIFT RIGHT" "P" (simultaneously) followed by the mnemonic and then PAGE SEL.

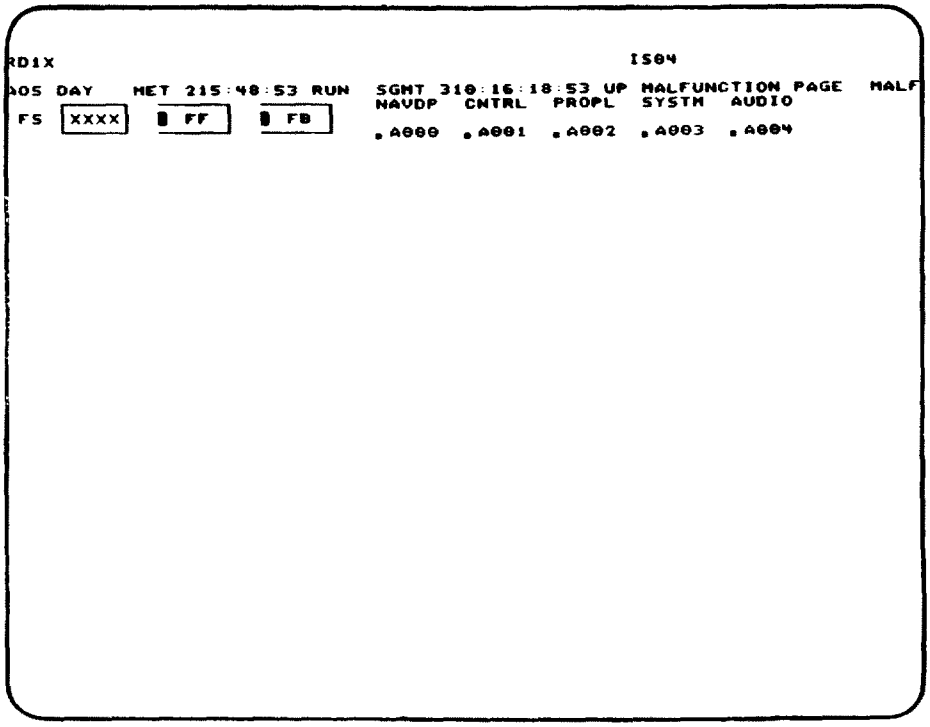

Figure 18 – Malfunction menu.

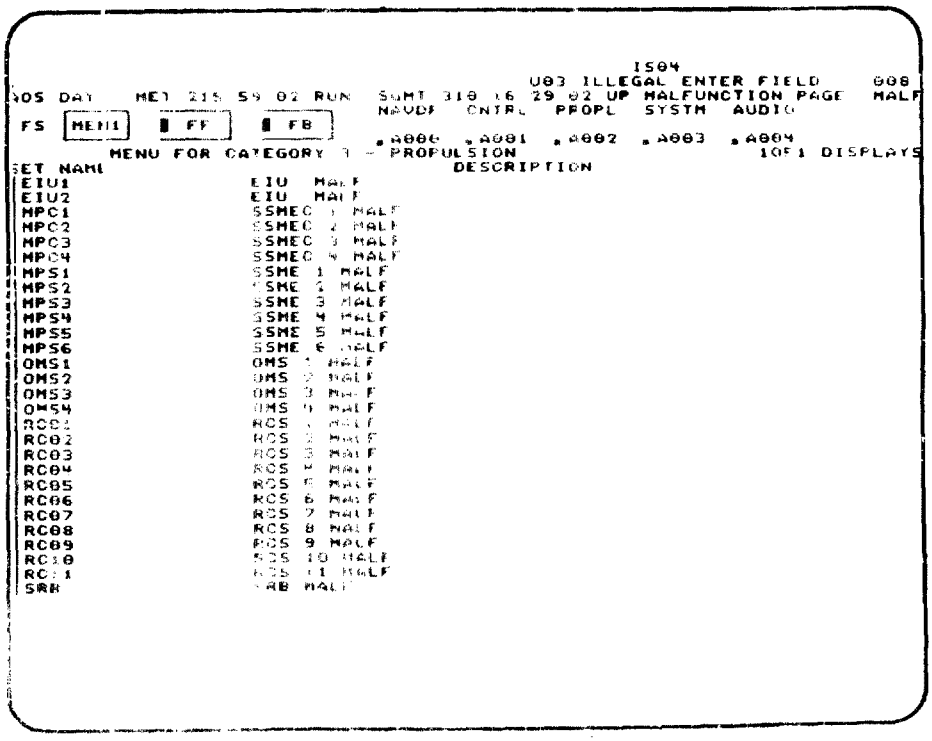

Figure 19.- The malfunction category menu.

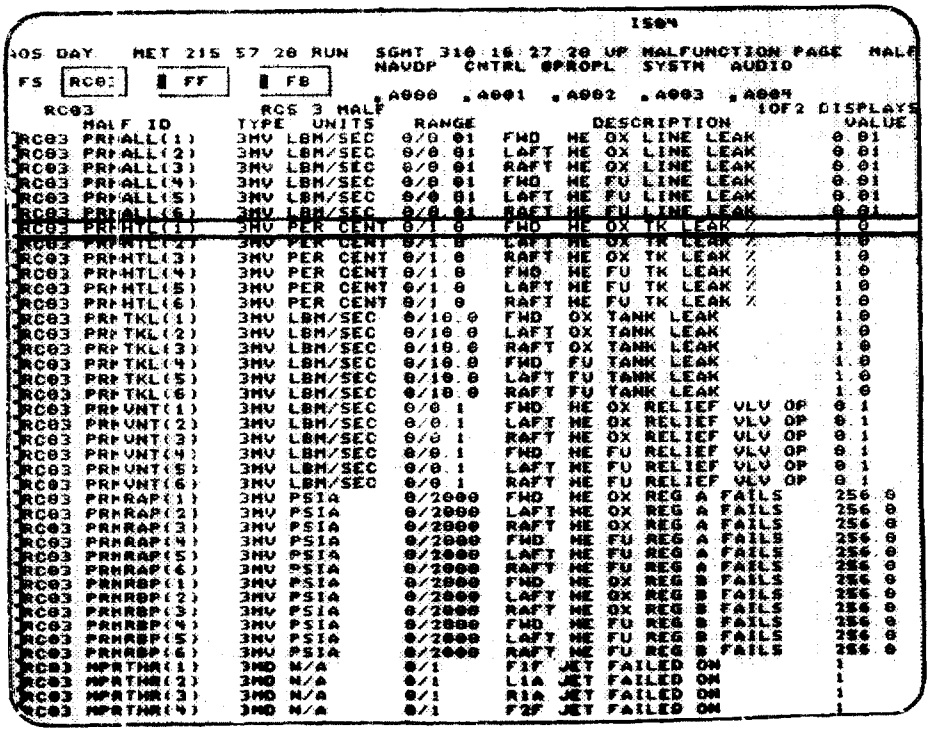

Figure 20.– Malfunction page.

Malfunction Selection

The malfunction pages contain the following information (in order from left to right across the page): page mnemonics, malfunction mnemonics, malfunction type, units of variable input, ranges for variable input, malfunction description, and display value (the value, such as leak rate or sensor bias, which is displayed when the malfunction is first called up). Under the column "TYPE," the number represents the category number (1 through 5). The letter M indicates the same mnemonic is used for multiple malfunctions and the mnemonic is indexed to distinguish which unit it applies to. The letters D and V represent malfunctions which may affect other systems, discrete malfunctions, and variable malfunctions, respectively.

After locating the desired malfunction, light-pen its corresponding mnemonic. This transmits the malfunction to the instructor station computer and enters it on the malfunction control page. It is only through this interactive page that malfunctions can actually be activated or deactivated. For our example, simply light-pen the mnemonic PRMHTL(1) anywhere along that line.

Note: Light-penning the same mnemonic again removes the malfunction from the control page, allowing room for other malfunctions or removal of those erroneously assigned.

Malfunction Activation

To activate the malfunction, call up the malfunction control page; this can be done in two ways. Light-penning the mnemonic A000, A001, A002, A003, or A004 will call up the corresponding malfunction control page on the interactive screen. An alternate way of calling up the page is by typing the appropriate mnemonic on the interactive line and depressing PAGE SEL. In this example, simply light-pen or enter A002 to display the malfunction summary page for propulsion (see figure 21). If you desire to continue the malfunction at a different value (e.g., lowering a leak rate) light-pen the displayed value, enter the new value via the enter key, and light-pen the mnemonic again. (This last step is necessary to implement the new value.) The malfunctions are now ready to be activated.

Activation of a malfunction is done by light-penning the mnemonic of the malfunction listed in the left column of the page. This causes the displayed value directly below the mnemonic to be displayed in reverse field and also displays the MET at which the malfunction was activated. Thus, in this example, we would enter the desired leak rate in percent and light-pen PRMHTL(1).

To deactivate a malfunction, insert a zero for the value and light-pen the mnemonic again. The malfunction value will no longer be in reverse field and the deactivation MET should appear. To deactivate all the malfunctions on the page, light-pen the field DEACT PAGE located at the top left of the page. Light-penning CLEAR PAGE clears the page of all malfunctions. If only a few of the malfunctions need to be cleared, enter "DES" in the value field and light-pen the mnemonic. Note that between resets malfunctions are deactivated automatically, but not dropped from the page. A reload removes the malfunctions from the page.

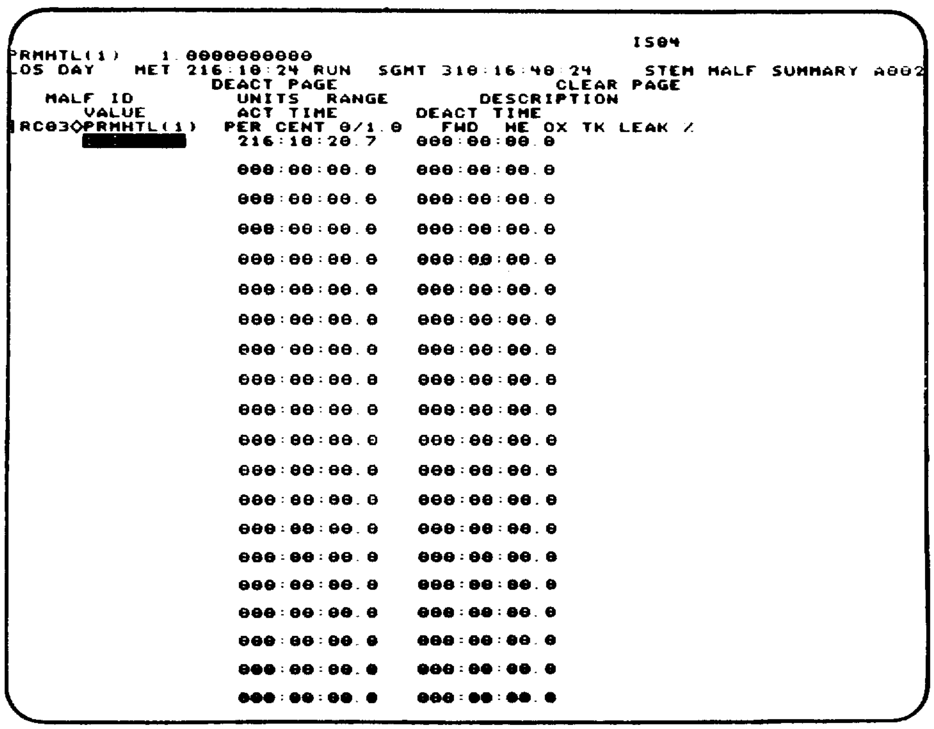

Fig. 21.– Malfunction Summary page.

Hardcopy Control Page (A010)

The Hardcopy Control page (see figure 22) performs two functions. It allows you to automatically hardcopy at certain intervals any two screens you select. The time interval between copies, the start and stop times, and the selected screens can be controlled from the blocks in the middle of the page. The other function is to temporarily deselect any screen that has been selected for automatic hardcopying. This comes in handy when you do not want the information displayed to be copied (e.g., during sessions for secure flights). To use either function, the page must be displayed on an interactive screen. When enabling the hardcopy function, light-pen the screen ID under SDU (screen display unit) and bracketed by IS to identify which screen will be copied. Next, light-pen the field under "TIME INTERVAL," depress the light-pen button to move the cursor to that position, type in the desired time interval and depress the ENTER key. The field will then update to the specified value. Start and stop times are input in the same manner. When disabling the hardcopy of a screen, light-pen the appropriate screen under EVENT DISABLE next to the IS keyboard system.

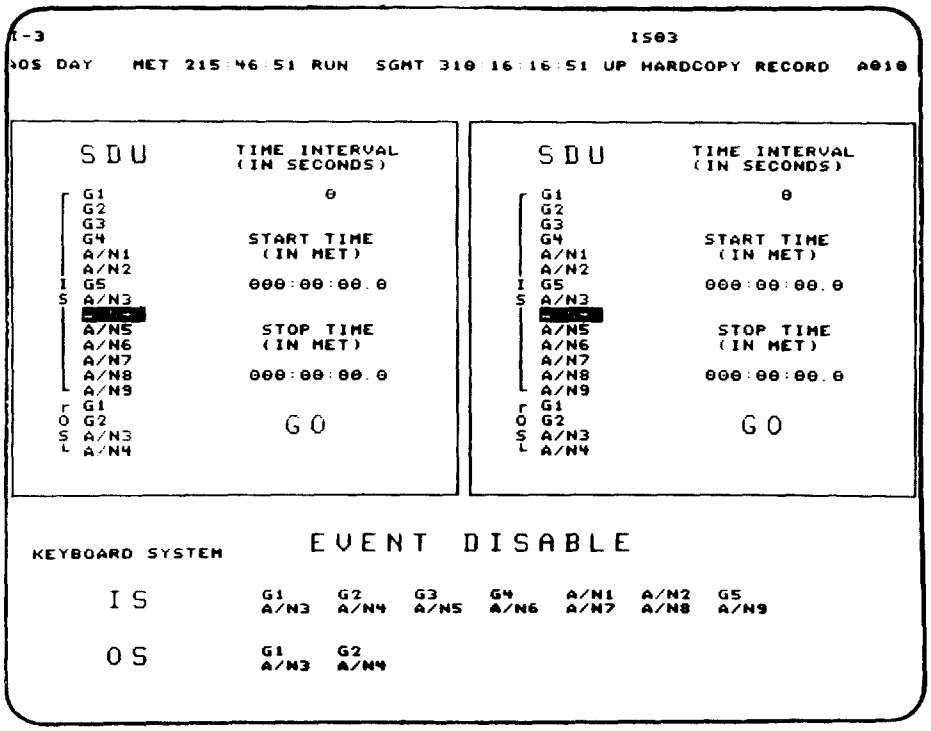

Figure 22. – The Hardcopy Control page.

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Caution and Warning Pages (S430 –S437)

There are eight pages that list the 120 caution and warning (C&W) parameters. Listed for each parameter are the normal range, the current value, and the low and high limits that trigger the C&W alarm. To inhibit any of the alarms, simply light-pen the word "INH" on the far right side of the page that corresponds to the parameter. Figure 23 shows the first of these pages.

-305 ISS9

:S DAY MET 191:18:46 RUN SGMT 037:12:18:46 UP S430 C/W PARM. 000-015

CHANNEL	PARAMETER	RANGE	VALUE	LO LIM	HI LIM	INH
000	O2 TANK 1 PSIA	515→1015	830.	540.	985.	INH
001	O2 TK 1 HTR 1 TEMP	-425→475	-175.	405.6	349.	INH
002	FC 1 O2 REACT VLV	OPEN/CLS	OPEN	0V	LL	INH
003	MAIN A VOLTAGE	0→40	29.79	26.40	.8	INH
004	CABIN PSIA	0→20	14.98	13.8	15.2	INH
005	GPC 1	NRM/FAIL	NORM	HL	5V	INH
006	FWD RCS OX TK PSIA	0→400	257.	200.	312.	INH
007	L OMS OX TK PSIA	0→400	255.	232.	284.	INH
008	APU 1 EGT	0→1500	1115.	HL	1260.	INH
009	MPS 1 HE TANK PSIA	0→5000	569.	1150.	LL	INH
010	O2 TANK 2 PSIA	515→1050	830.	540.	985.	INH
011	O2 TK 1 HTR 2 TEMP	-425→475	-175.	HL	349.	INH
012	FC 1 H2 REACT VLV	OPEN/CLS	OPEN	0V	LL	INH
013	MAIN B VOLTAGE	0→40	29.8	26.40	LL	INH
014	O2 REG 1 FLOW #/HR	0→5	0.00	HL	5.	INH

VALUE = GREEN PARAMETER IN TOLERANCE
VALUE = RED PARAMETER OUT-OF-TOLERANCE

Figure 23.– Caution and Warning page.

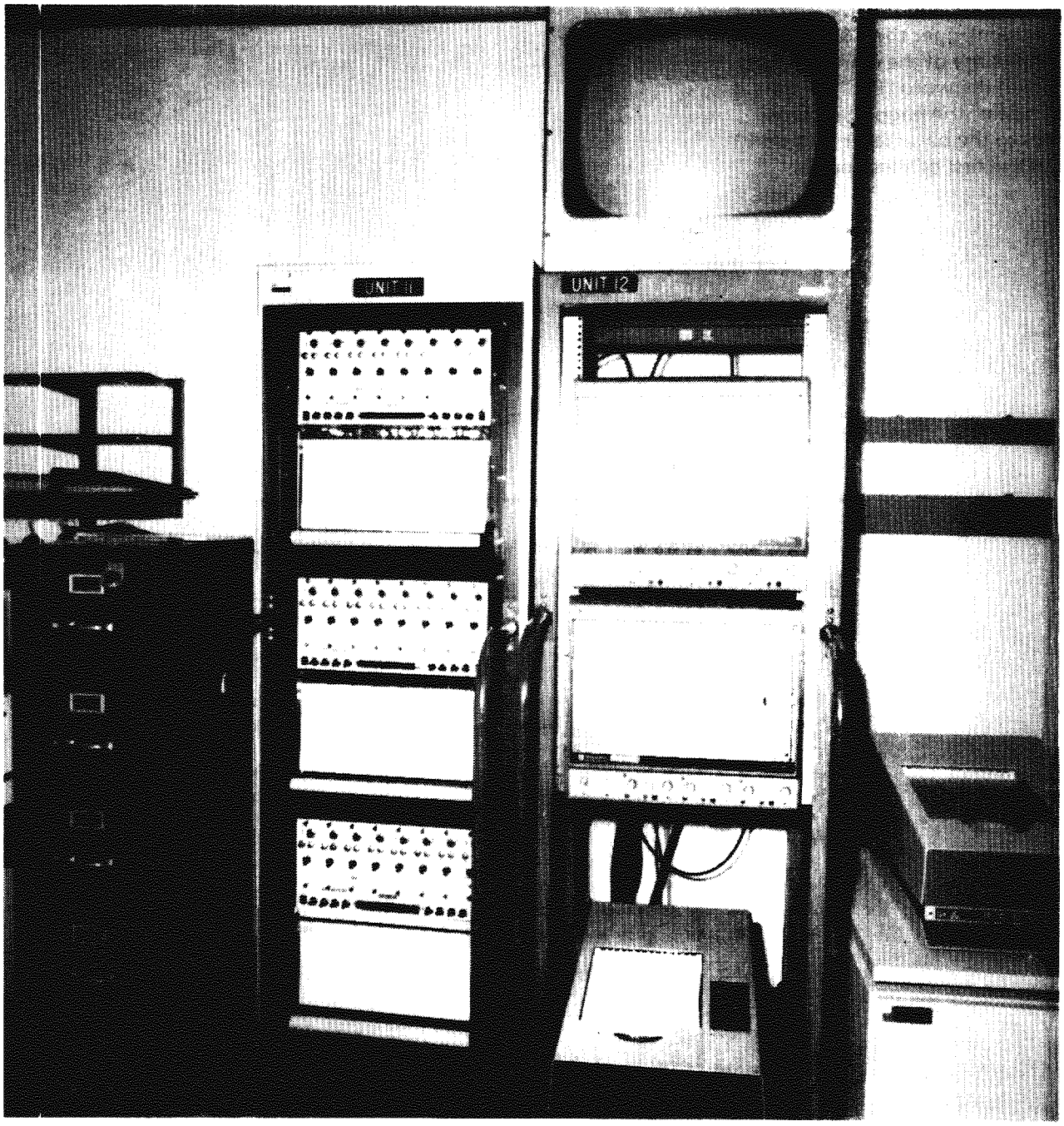

Figure 24.– The strip chart recorders and x-y-y' plotters.

Data Retrieval and Data Logging

Data retrieval and data logging provide the instructor with the capability to access simulation data needed to assess a training exercise or to verify simulation operations during checkout. Data retrieval is the real-time output of instructor-specified data on recorders and plotters within the IS. Data logging consists of a post-run lineprinter output of data recorded during a simulation. Both methods provide a wide variety of data (e.g., Orbiter lift-to-drag ratio, control surface deflections, structure temperatures). The set of parameters to be logged or retrieved is called a block and given a name. Basic data blocks, defined with each simulation load are available; blocks may also be modified or created. The blocks available as part of the simulation load are defined in TBD, and the legal parameters and their mnemonics are defined in the SMS master file listing (MFLIST) maintained at the IS.

Strip Charts and Plotters

There are three x-t (strip chart) recorders and two x-y-y' plotters located in the back of each instructor station room; figure 24 (at left) is a picture of this equipment.

Each of the three x-t recorders has eight pens, with the top recorder containing pens 1 through 8, the middle one containing pens 9 through 16, and the bottom one containing pens 17 through 24. Speed and line quality can be controlled using the pushbuttons and knobs in the control section (see figure 25) above the paper; the calibration control knobs are used only by the SMS technicians. The x-y-y' plotters are located next to the recorders and are not used very often; thus, you may need to call the SMS operator to have them calibrated (turning the machine off automatically erases any previous calibration).

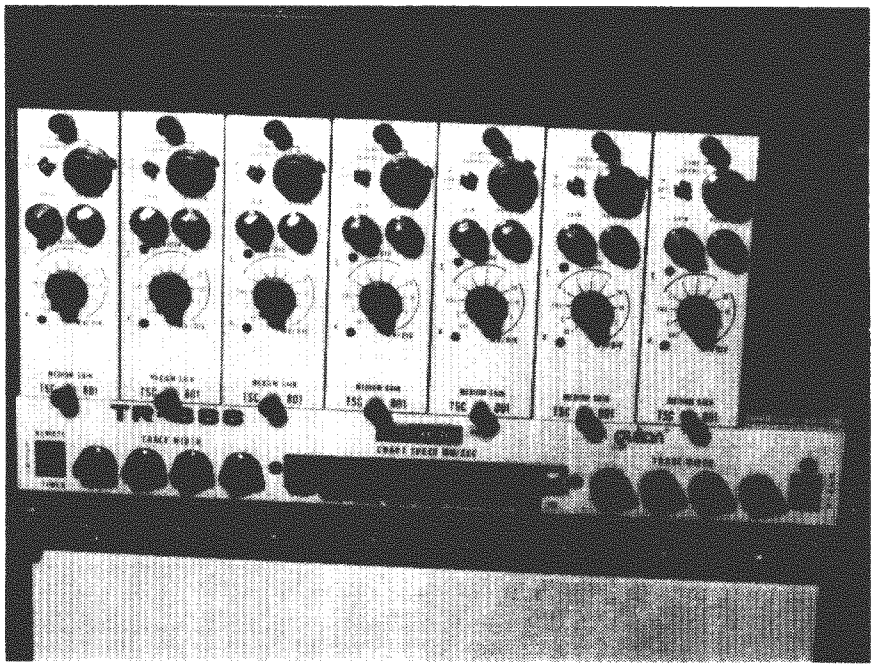

Figure 25. - The controls for the strip chart recorders.

Communications Panel

Figure 26 is a representation of the communication panel (comm panel or keyset) at the SMS. It consists of commercial telephone lines and various communication loops that enable personnel in the instructor station, the crew station, the operator area, and the simulation control station (SCA) in building 30 to communicate with one another. This section briefly describes the comm panel and explains how the instructor can use it.

Panel Description

1. The Private Access Branch Exchange (PABX) dial allows the instructor access to both onsite (JSC) extensions and commercial lines as required. These telephone lines should be limited to official business.

2. The MONITOR VOLUME switch enables the instructor to control the volume level of the loops being monitored.

3. The Monitor Volume Indicator illuminates when the volume is lowered to the point where it cannot be heard over a conversation on a talk loop. To ensure that you are capable of monitoring all assigned loops, do not turn down the volume to the point where the indicator illuminates.

Key Description

When using the keys on the communication control panel, keep in mind that the yellow keys are used for monitoring purposes only and the white keys are used for both monitoring and talking over the loop. Only one loop at a time can be used to communicate.

HOLD: This blue key is used for holding telephone calls received over the PABX.

BUZZ C/O: This yellow key enables and disables the buzzer for incoming PABX calls. The buzzer is enabled when the key is not illuminated; it is cut off (C/O) when the key is not illuminated.

RLS: This red key releases a previously established talk/listen loop.

PABX: The private access branch exchange key, when depressed, allows for two-way communication over the assigned telephone line.

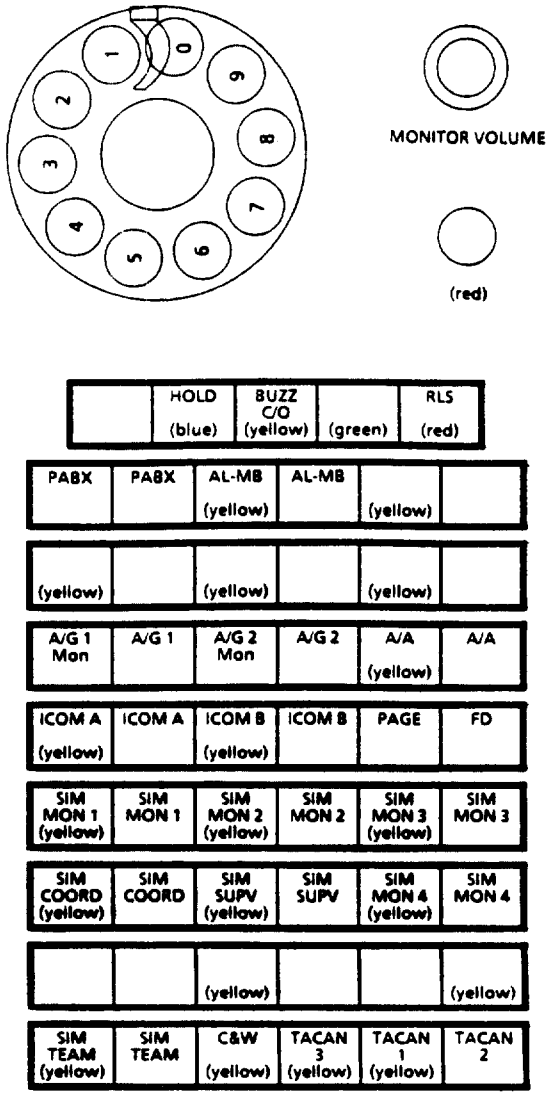

Figure 26.– Communications panel.

AL: The astronaut loop is hardwired independently of the modeled communication system and is available for safety reasons.

A/G 1 and A/G 2: These are air-to-ground loops used by the Orbiter crew to communicate with the Mission Control Center (MCC).

A/A: This is the air-to-air loop used primarily for entry. Since it is a UHF communication system the ground can communicate with the Orbiter crew.

ICOM A and ICOM B: These loops simulate the internal Orbiter crew intercom system.

PAGE: This key is not used by the instructor.

FD: Depressing this key enables you to monitor the flight director's communication during an integrated simulation training session.

NOTE: The simulation monitor and the simulation coordination lines allow communication between the instructors in building 5 and the SCA instructors in building 30 during integrated simulations. Instructors are assigned to particular loops on the basis of the system they control.

SIM MON 1: This loop is used by the DPS/DYN monitors in building 30 when they want to communicate with the nav instructors in Building5. This loop is also currently used by the RMS prox ops and rendezvous instructors.

SIM MON 2: This loop is used by the SYS monitors in building 30 to communicate with the SYS instructors in building 5 to coordinate any systems activity during an integrated simulation.

SIM MON 3: The COMM and PAYLOADS monitor in building 30 uses this loop to discuss communication activity with COMM personnel at the SMS and network simulation system (NSS) in building 5.

SIM COORD 1: This loop is used as a call loop to reach anyone not acknowledging calls directed to his or her particular position over the assigned loop. The FD and the SIM SUPV can use this loop to talk to each other.

SIM COORD 2: This loop is used by the payloads instructors in the SMS and SCA to coordinate payloads training. This loop is also used by the DOD Satellite Control Facility (SCF) at Sunnyvale AFS, Calif. during joint integrated simulation sessions.

SIM SUPV: This loop is used by the simulation supervisor in building 30 to discuss simulation activities with SMS personnel and instructors in buildings 30 and 5.

SIM MON 4: This loop is used by the BOOSTER andGNC/PROP monitors in building 30 to discuss guidance, control and propulsion activities with the CONT instructors in building 5.

SIM TEAM: This loop enables the instructor to monitor and, if required, communicate with the operator station or other members of the SMS team, NSS instructors, or spacecraft simulation instructors.

C&W: Using this loop, instructors can monitor caution and warning alarm tones activated in the crew station.

TACAN 1, 2, 3: When these keys are used, tactical air navigation (TACAN) tones can be monitored.

Placing and Receiving Calls

To place a PABX call:

1. Depress the PABX key; it should illuminate.

2. Listen for a dial tone.

3. Dial the desired number.

4. Depress the RLS key to release the line after you finish your conversation.

When receiving a call over the PABX:

1. Depress the PABX key when the buzzer sounds and the PABX key is flashing on the console.

2. If you cannot immediately respond to the call, depress the HOLD key. The PABX key will begin to flash. To return to the call, simply depress the PABX key again.

3. After you finish your conversation, depress the RLS key or select another talk/listen key.

When initiating a call over the loop:

1. Select the appropriate loop; since you desire to talk, depress the white key. If you want to talk to the astronaut crew about simulation-peculiar information select the ICOM A or B or the AL white key.

2. State the station being called; then state the calling station. Enter the loop like this: "Crew station – Instructor station" or "PLT – Nav." If the loop being used may not be obvious, identify the loop: e.g., "PLT – Nav on ICOM B."

3. Wait for an acknowledgment ("Go ahead, instructor station") then continue with your message.

When you have completed your message,you can exit the talk/listen loop by depressing the release (RLS) key or another talk/listen key.

***Note:** During integrated sims, do not talk with the crew during AOS periods and only if necessary during LOS.*

When receiving a call over the loop:

1. Listen for your station's call sign (remember to keep your volume control adjusted so that the volume monitor light is not on): "Instructor station - Operator station."

2. Depress the appropriate white key; in this case the correct key would be the SIM TEAM key.

3. Acknowledge receipt of the call by identifying your station: "Instructor station, go ahead."

These are just a few examples of how to communicate over the various loops. Observing other instructors at the instructor station will increase your proficiency in communication loop procedures.

Summary of a Typical Training Session

The previous sections of this book have dealt with the specifics of operating the keyboards, calling up displays, the displays themselves, data retrieval and data logging, activating and deactivating malfunctions, and communications protocol. Now let's incorporate all this material into a brief dry run of a typical training session.

Run Preparation

The instructor should arrive at the appropriate SMS instructor station (approximately 30 minutes before the scheduled start of an integrated training session and 10 minutes before a non-integrated session) and note any problems with the simulator that the previous team may have experienced.

At the position where the instructor usually sits (in order from left to right: navigation, control, team lead, and systems), plug into a headset jack located under the console table and select the desired voice loops. For nonintegrated simulations, usually the astronaut loop (AL), crew station intercom (ICOM A&B), caution and warning (C&W) alarms, and SMS operator (SIM TEAM) loops are sufficient. For integrated simulations, the air-to-ground loops, simulation monitor loops for the Simulation Control Area (SCA) specialist in your subject area, the simulation supervisor at the SCA, and the flight director in the Mission Operations Control Room (MOCR) should also be selected.

If it has not already been done, someone (usually the team lead) must give the SMS operator the specific mission phase reset point for the session. Other factors such as look and enters (if any), visual scenes, and graphics displays should all be initialized.

The next step is to check the crew station switch positions. Taking this step will prevent unwanted C&W alarms or SMS "launch holds." The switch positions are checked by calling up the appropriate displays and comparing them with the displays in console handbooks which show the correct positions for different flight phases. (After you become experienced, you may be able to recall these.) If there are switches out of position, they must be physically set to the proper configuration in the crew station. Do not merely light-pen the switch from the instructor station, since this does not actually move the switch inside the crew station.

If there are any malfunctions that need to be entered when or soon after the run starts, it is a good idea to set them up on the malfunction control page before going to run. However, wait until the SMS is in the freeze mode before attempting this, since the instructor stations do not respond to any commands when the SMS is in the reset mode.

When setting up malfunctions, be sure you don't activate them (i.e., by depressing the button on the light pen) until the appropriate time, either per script or by real-time coordination with the team lead. Once activated, a malfunction takes effect immediately; thus, time-critical malfunctions, such as main engine or GPC failures during ascents, if not entered at the right time, may defeat the purpose of the run.

If there is a need for the x-y-y' plotters or the strip chart recorders, be sure that they are calibrated. If not, ask the operator to have someone calibrate them for you.

During the Run

When all the instructors and crewmembers are ready for the run, the team lead will request the operator to change the SMS status from freeze to "run." During the run, the instructor's main responsibilities are (1) to monitor crew actions and procedures for troubleshooting anomalies, (2) to answer crew questions in your area of expertise, and (3) to enter malfunctions and parameter variations affecting Orbiter performance in order to exercise the crew in different flight situations. In addition, you will sometimes need to make simulated ground calls to the crew.

When activating malfunctions, inform the team lead. The SCA monitor (if it is an integrated session) will inform you when to enter a malfunction. Malfunctions can be entered either according to a script or through real-time coordination with the other team members during nonintegrated simulations.

After the Run

Following the run there will be a debriefing. This is the time when instructors (or SCA monitor for an integrated session) take turns telling the crew what malfunctions were entered and informing them of any erroneous actions the crew may have taken and the correct actions that should have been taken. Also, the crew will ask questions which you may or may not be able to answer at the time. The questions that cannot be answered should be researched and answered in writing after the session.

After the debriefing, prepare for the next run by checking the switch positions again and setting up any new malfunctions. Usually the crew will have repositioned the switches in preparation for the next run, but, if they missed any, have them (or someone in the crew station) reposition those switches.

The above information is merely a guide to help you through the first few training sessions. These procedures, along with the rest of the information in the book, will become relatively routine after you have been assigned to a training team for a little while.

Conclusion

The Shuttle Mission Simulator instructor stations in building 5 are used by training instructors during integrated and nonintegrated flight simulation sessions to monitor crew perfomance to control systems models and to enter malfunctions to accomplish training. The two independent stations, one for the fixed base and one for the motion base simulator, have interactive CRT displays, control keyboards, voice loop control panels, and data retrieval devices to ensure effective crew training for the Shuttle flights.

This introductory book is designed to help new training instructors start out at the SMS. However, the best way to become familiar with the operations at the instructor stations is through actual hands-on experience. More specific procedures are contained in the SMS/SCA Simulation Procedures manual and in the handbooks for each SMS team position.

Appendix A: Data Retrieval and Data Logging Procedures

Retrieval

Both the recorders and the plotters are operated from the instructor station via the display DATA RETRIEVAL (page mnemonic RD1X). Figure 27 is an example of this page. The light pen and data entries, the block to display (RDIX) commands, the output devices, and the parameter ranges may be specified. The following steps are the procedures for data retrieval using the recorder or plotters

1. Call up page RD1X, decide which block you wish to use, and enter its name in (A).

2. Enter a "1" in (B) and a "1000" will appear. In addition, the first six parameters in the block will appear in (E), the numbers 1 through 6 in (D), and the minimum and maximum values in (F) and (G).

3. Decide whether you want to data output only on the recorders (also called X-T blocks), only on the plotters, or on both. As a matter of practice, set up for both by entering a "3" in (C).

4. Now enter a "3" in (B), which will cause a "3003" to appear and then update to "3000" if all goes well.

5. At the recorder, identify the data charts with the run name, the date, the recorder number, and any other pertinent information. Then at run start, select the speed desired to record the data.

6. Recording will continue as long as there is paper available and the recorders are turned on. If a reset occurs and the same block is desired, all you need to do is turn the recorders back on. If a reload occurs, however, it is necessary to return to step 1.

There may be times when you want to change certain parameters within a block. This may be done by the following steps:

1. Call up page RDIX.

2. If you are simply going to change an existing log block, enter its name in (A). If you are going to build an entirely new block, create a name for it and enter the name in (A).

3. Once the block name is entered, insert a "1" in the command field (B). This causes a "1000" to appar in this field and the first six parameters of the block to appear in (E), the numbers 1 thru 6 in (D), and the minimum and maximum values in (F) and (G). If you are creating a new block, you may enter in (E) any of the parameters listed in the MFLIST.

4. To change any parameter listed, simply use standard light-pen procedure to enter the new mnemonic. If it is a vector or a matrix term, be sure to enter the proper displacements in (I), (J), and (K).

5. Minimum and maximum values should be carefully chosen so that there is a logical division to the strip chart recording. Be sure to bracket the expected range and set up the end values logically. For instance, if the expected range is 0 to 7, set the minimum and maximum values equal to 0 and 10. Occasionally, it may be necessary to enter a value which is outside the "normal range." The page will display values up to nine digits with three decimal places. Values larger than this will be accepted but will either be rounded off or displayed as asterisks (***).

6. When all changes have been made to the list of displayed parameters, call up the next six by entering a "2" in (B). This causes a "2000" to appear along with the next six parameters.

7. Continue making changes as outlined. When the last change has been made, enter a "2" in the command field. If you are already at the last pen, the command field may display "992002"; this is normal.

8. The next step is to save this block. To do so, first look at the sheet of paper listing all the reset points (on console). To the right side will be a penciled listing of already saved blocks. Choose a number from 1 through 10 that is not taken. Enter this number in (B) as "N4," where N is the chosen number. A "4000" will appear.

9. The saved block can be recalled by entering "N5" in (B). This will cause a "5000" and the first six parameters to appear. If you want to page through and examine the terms, it is necessary to enter a series of "2's" in (B). To start the recording, simply enter a "3" in (B), wait for the"3003" to clear to "3000," and then turn on the machines.

10. These saved blocks will be available until the next load is delivered or until someone writes over them. Note: these changes do not affect the original blocks; they create new ones.

For all data blocks, the first 24 pen numbers control the strip charts, while the last six control the two plotters (i.e., pens 25, 26, 27 correspond to the x, y, y' parameters for the top plotter and pens 28, 29, 30 correspond to the x,y, y' parameters for the bottom plotter).

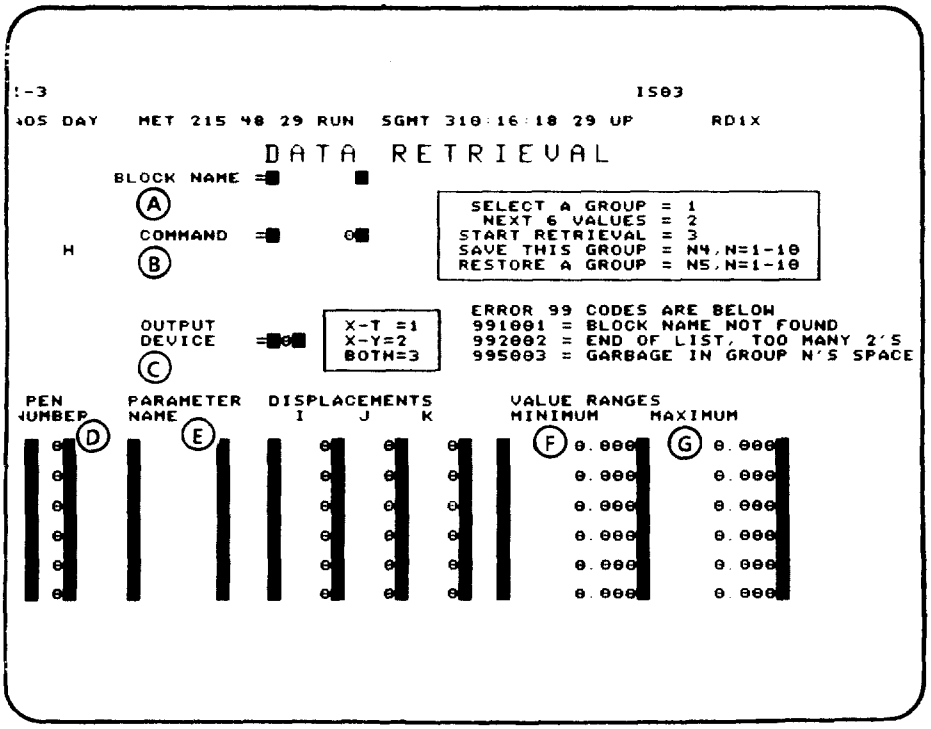

Figure 27.– The Data Retrieval page.

Logging

The data logging system allows the user to record up to 200 parameters during a run on a tape to be "dumped" or printed out at a desired frequency and range. It is controlled from the instructor station via the display DATA LOGGING (page mnemonic RLPG). Figure 28 is an example of this page. The procedure for logging data is similar to that for retrieving data and requires the following:

1. Call up page RLPG, decide which block you wish to use, and enter its name in CAS.

2. Enter a "1" in B and a "1000" will appear.

3. Enter an identification number in the RUN D block (C) before starting the data log. An example of the standard form is

B	3	01	07
run	team	month	day

4. Enter the logging frequency (1 through 99) in (D), FREQ. Generally, data are provided at 25 hertz (i.e., 25 samples per second or once each 0.04 second). Entering a "1" in FREQ causes all the data to be recorded. Entering a "25" causes only every 25th sample to be recorded (i.e., a logging frequency of once every second). Entering a "50" causes only every 50th sample to be recorded, with a resultant frequency of once every 2 seconds.

NOTE: The correlation between frequency and log time is as follows:

Freq	*Log Run Time*
1	*10 min*
25	*~4 hrs*
50	*~8 hrs*

The number entered under frequency is the number of 0.04-second intervals between data takes.

5. Now enter a "3" in (B) which will cause a "3003" to appear and then update to "3000" if all goes well.

6. Start and stop the logging by entering in (B) a "4" and a "5," respectively. The validity of these commands is noted by a "4000" and a "5000". If the SMS is in the freeze mode, the data logging will start automatically upon entering the run. Automatic start and stop based on MET can be obtained by entering the start and stop times in the appropriate spaces in the middle of the page.

7. Entering commands "1," "3," "4" in this order restarts the logging once it has been stopped. Note that, if these commands are entered in the wrong order, an error message will appear and the entire procedure will have to be repeated.

8. The box at the right of the screen labeled (E) indicates the amount of log file remaining, in percent. It is recommended that you ask for the log to be copied to tape and the tape to be saved for at least 1 week. This involves filling out a request form which can be found at the instructor stations.

9. Once the log is copied to tape, it is possible to "reset the pointer," which gives you 100 percent of the log file back again. This is done by entering a "6" in the command field (B). This causes a 6000 to appear and 100 percent of the log file to show as remaining.

10. You are now ready to log again by returning to step 3.

11. The delogs will be ready for pickup the next day. They are placed in the bins in the building 35 lobby.

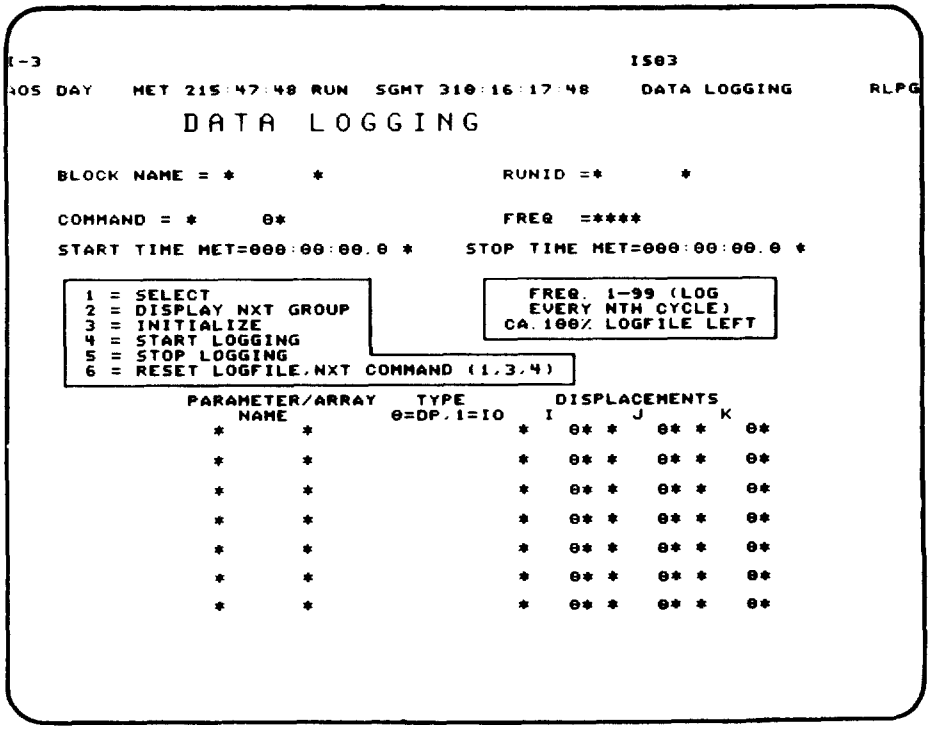

Figure 28.– The Data Logging page allows the user to record up to 200 parameters on tape for printout after the run.

Revising Data Blocks

Existing data block can be changed by the fol owing procedure:

1. Call up page RLPG.

2. If you are simply going to change an existing log block, enter its name in (A). If you are going to build an entirely new block, create a name for it and enter the name in (A).

3. Once the block name is entered, insert a "1 " in the command field (B). This causes a "1000" to appear in this field and the first seven parameters of the block to appear in (F). If you are creating a new block, you may enter in (F) any of the parameters listed in the MFLIST.

4. To change any parameter listed, simply use standard light-pen procedure to enter the new mnemonic. If it is a vector or a matrix term, be sure to enter the proper displacements in (I), (J), and (K).

5. After the first seven parameters are changed accordingly, call up the next seven by entering a "2" in the command field. This causes a "2000" to appear along with the next seven parameters.

6. Repeat steps 4 and 5 as needed to change or enter all the desired parameters.

7. IMPORTANT – When all parameters have been changed, enter a "2" in the command field. This will cause the changes made to the last set of parameters to be written into the memory.

8. At this point, continue with standard logging procedure.

9. Note that resets have no effect on your new log block, but reloads, unfortunately, mean that you must reload your block.

The definitions for the parameter mnemonics of all the data blocks can be found in the SMS master file listing (MFLIST).

Appendix B: Acronyms and Abbreviations

AL	astronaut loop
AOS	acquisition of signal
cb	circuit breaker
C&W	caution and warning
CCTV	closed-circuit television
CNTRL	control
C/O	cutoff
CRT	cathode-ray tube
D&C	display and control
DOD	Department of Defense
FD	flight director
FBIS	fixed base instructor station
FRZ	freeze
GPC	general purpose computer
ICOM A&B	crew station intercom A&B
IOS	Instructor operating station
IS	instructor station
JSC	Lyndon B. Johnson Space Center
LOS	loss of signal
lt	light
MBIS	motion base instructor station
MCC	Mission Control Center
MET	mission elapsed time
MFLIST	master file listing
MOCR	Mission Operations Control Room
NAVDP	navigation and data processing
NSS	network simulation system
PABX	private access branch exchange
PCZ	physical control zone
PROPL	propulsion
PSO	parallel switch override
RCS	reaction control system
RLS	release
RMS	remote manipulator system
SCA	simulation control area
SCF	Satellite Control Facility
SDU	screen display unit
SGMT	simulated Greenwich mean time
SMS	Shuttle Mission Simulator
sw	switch
SYS	system
TACAN	tactical air navigation
tb	talkback (switch)

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